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SECOND SERIES: PULMONATA.

MANUAL

OF

CONCHOLOGY

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

FOUNDED BY

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VOL. XVIII.

ACHATINIDÆ: STENOGYRINÆ AND CŒLIAXINÆ.

PHILADELPHIA:

Published by the Conchological Department,

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

1906.

Dates of Issue of the Parts of Vol. XVIII.

Part 69, pp. 1 to 64, plates 1 to 10, January 20, 1906.
Part 70, pp. 65 to 160, plates 11 to 20, April 10, 1906.
Part 71, pp. 161 to 272, plates 21 to 34, October 2, 1906.
Part 72, pp. 273 to 357, plates 35 to 51, January, 1907.
Title-page, Contents and Introduction, pp. i to xii, January, 1907.

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GEOGRAPHIC DISTRIBUTION OF THE ACHATINIDÆ.

The distribution of Achatinidæ indicates an African center of evolution where the group probably originated, and in which the main phyla and genera had their rise. The early members of the family are unknown or have not been recognized. They are to be looked for in mid-mesozoic deposits, with their allies the ancestral *Megaspiridæ* and *Clausiliidæ*. From the African center, Stenogyrine and Cœliaxine Achatinidæ migrated to South America before the interruption of land communication across the tropical Atlantic. Later, the radiation of Stenogyrinæ extended to India and the East Indies. This probably took place in the north of Africa, above the area in which the subfamily *Achatininæ* had meantime arisen. The *Achatininæ* have probably never extended beyond their present area, being unknown in European or Indian tertiary strata, or in the recent fauna outside of tropical and South Africa and Madagascar, except where recently imported. They are a lateral branch from the more primitive *Stenogyrinæ*.

The *Cœliaxinæ* are obviously an ancient group evolved in mesozoic time, and now approaching extinction.

SUBFAMILY STENOGYRINÆ.

This very extensive subfamily, comprising 29 genera and about 500 species, has not before been made the subject of monographic research, and although a few of the genera have been carefully studied, there has yet been no adequate classification of the group.

Anatomical data are still lacking on many of the genera, and very few have been sufficiently investigated. A division of the subfamily into five series of genera or phyla is indicated by data presented in this and the preceding volumes. Three of these phyla are represented in Africa, Asia and America. The phyla are as follows:

I. Subulina phylum.
II. Leptinaria phylum.
III. Opeas phylum.
IV. Rumina phylum.
V. Obeliscus phylum.

Of these, phyla I, II and III are closely related, and together form a group systematically equivalent to either of the others.

I. *Subulina phylum.*

The shell varies from ovate to turrite, the latter being the prevalent contour. The columella is truncate basally, achatinoid, and the summit is bulbous and hemispherical with few exceptions.

The genera are as follows:

America.	*Africa.*
Subulina.	Subulina.
Luntia.	Ceras.
Tornaxis.	Homorus.
	Pseudoglessula.
S. E. Asia.	Chilonopsis. (St. Helena).
Bacillum.	Bocageia (+ Petriola).

The positions of *Luntia* and *Tornaxis* are still uncertain. Their soft anatomy is unknown, and I have not seen the shells. They may possibly be Oleacinoid. *Bacillum* seems most akin

to *Homorus*. The African genera seem to be closely related except the insular *Bocageia* and *Chilonopsis*, which are specialized groups. Africa is the headquarters of the Subulinoid group.

Subulina octona has been described and dissected very fully by Wiegmann. The jaw varies from finely and closely striate (pl. 50, fig. 25) to plaited, the latter condition due apparently to immaturity. The radula has from 30,1,30 to 36,1,36 teeth (pl. 51, fig. 1). The middle tooth has a well-developed cusp with more or less distinct traces of side cusps, especially in embryos, indicating a primitively tricuspid condition. The lateral teeth are tricuspid, and pass gradually into the marginal type. The latter remain tricuspid, but often the ectocone is split on the outer teeth.

The kidney is long, triangular, somewhat curved, 6 or 7 mm. long, 1.8 wide at the base. It is about half as long as the lung and three or four times the length of the pericardium. The secondary ureter is closed throughout.

The genitalia (pl. 50, fig. 24) are remarkable for the great development of the female organs, with poorly developed or rudimentary male organs. In immature shells of 6 mm. length there are eggs in the uterus, while the penis, etc., is very little developed, suggesting that the female organs precede the male in functional activity. The small penis is simple, as in *Rumina*, with a terminal retractor. The uterus contains several—at most four or five—subglobular, hard-shelled eggs 2 to 2.1 mm. in diam., the anterior ones containing embryo shells. The spermatheca has a very short duct.

The right ocular retractor passes between the branches of the genitalia.

The dentition of *Homorus, Chilonopsis*, etc., has been figured in Vol. XVII.

II. *Leptinaria phylum.*

Ovate or turrite shells with the columella truncate at base, and the parietal wall usually armed with a median lamella, though it is often absent. Reproduction oviparous or vivip-

arous. Radula of the ordinary Stenogyroid type. This group has characters of both the *Subulina* and the *Opeas* phyla. The genera are *Leptinaria* (p. 284) and *Ochroderma* (p. 325).

III. *Opeas phylum.*

Chiefly small, thin, ovate or turrite snails, usually perforate or rimate, with the columellar margin dilated, straight or concave, passing without truncation or notch into the basal margin. No parietal lamella. Oviparous or viviparous. Dentition as in *Subulina*, etc. The genera follow:

America.	*Africa.*	*S. E. Asia, etc.*
———	Hypolysia.	———
———	Curvella.	Curvella.
Opeas. Tristania.	Opeas.	Opeas.
Pseudopeas.	Pseudopeas.	Eremopeas.
———	———	Prosopeas.
———	———	Plicaxis.
———	———	Perrieria.

This phylum contains the most widely-spread groups, such as *Opeas*, which extends into Polynesia and has been found in German miocene deposits, and *Pseudopeas*, which is represented in South America and Africa, and in the subgenus *Eremopeas* extends into Australia, the only indigenous member of the *Achatinidæ* in that continent. Except *Curvella*, the other genera are restricted to comparatively small areas. Nothing is known of the soft anatomy of most of the genera.

Opeas panayensis (pl. 50, fig. 23, after Semper) has a larger spermatheca duct than *Subulina octona*. An egg dilates the uterus in the preparation figured. The kidney is very short. The same species was found by Wiegmann to have 28,1,28 teeth (pl. 51, fig. 2). There is a minute side-cusp on each side of the mesocone of the middle tooth. The laterals are nearly symmetrical, tricuspid.

Opeas caraccasense (= *beckianum*) from Misantla, V. C., Mexico, has been examined by Strebel. The foot (pl. 50, fig. 22) is short, with coarse rugæ, the marginal zone distinctly

indicated. The jaw is like that of *Subulina octona*. The central tooth is very small and rudimentary, without traces of side-cusps. These are rather weakly developed on the laterals. The genitalia are figured, pl. 50, fig. 22. The vas deferens is dilated before entering the penis. The penis is rather slender, thickened club-like towards the apex, where the retractor is seated. The very short-stalked spermatheca is inserted on the atrium, below the insertion of the penis, a remarkable position, which was however verified by the examination of more than one specimen. The uterus contained either eggs or embryos in specimen dissected by Strebel, and also in shells I have opened.

Prosopeas acutissimum has a low arcuate jaw which shows very fine vertical striation under a high power. Radula with about 38,1,38 teeth. The narrow middle tooth has a small cusp. The lateral teeth are tricuspid, with long, slender mesocones. The marginal teeth often split the ectocone (pl. 51, fig. 5). The radula of *P. tchehelense* is similar.

IV. *Rumina phylum.*

This group is somewhat heterogeneous. One genus (*Rumina*) has a bulbous, hemispherical embryonic shell which is lost in the adult, and it is oviparous. The others have a rather conic and entire summit. *Zootecus* is viviparous. All have the shell opaque, earthy, with the columella bulimoid, or at least not distinctly truncate at base. The following genera are placed here:

Madagascar.	*N. Africa, S. Europe, S.-E. Asia.*
Clavator.	Riebeckia, Zootecus, Rumina.

Nothing is known of the soft anatomy or reproduction of *Clavator*. The dentition of *Riebeckia* and the anatomy of *Rumina* have been described in vol. xvii, pp. 205, 211.

The teeth and jaw of *Zootecus* have been examined by Mr. A. Protz (Archiv für Naturgeschichte 1895, p. 106, pl. 8, f. 5, 6, *insularis*, and f. 7, 8, *pullus*), and by myself. The jaw is arcuate with rounded ends, with very fine vertical striæ.

The radula (pl. 51, fig. 10, *Z. insularis*) has 19,1,19 teeth in *Z. pullus*, 26,1,26 in *insularis*. The middle tooth is very narrow, with a single ovate cusp. Laterals with a long mesocone and small ectocone, but no trace of an inner cusp. On the marginal teeth both cusps become bifid. The absence of an inner cusp on the side teeth is a peculiarity *Zootecus* shares with *Rhebeckia*.

The genus *Cylindrogyra* Repelin (Annales Musée d'Hist. Nat. de Marseille, vii, 1902, p. 33) of the Cenomanien of central France, may possibly belong to this phylum, but its position is very doubtful. *Pyrgulina* Matheron, *t. c.*, p. 16, is a synonym of *Cylindrogyra*. The genus *Nisopsis* Matheron (*t. c.*, pp. 16, 64) is placed near *Cylindrogyra* by Repelin. It is conic-turrite and umbilicate, and to me has not the appearance of a Stenogyroid snail.

V. *Obeliscus phylum.*

Mainly large, turrite or cylindric shells, imperforate or nearly so, and in adults with the columella continuous with the basal lip or rarely weakly truncate, though the young or embryonic stage often has a truncate achatinoid columella. Most or all of the species are viviparous. Radula, so far as known, with unicuspid middle and tricuspid side teeth. The following genera belong here:

America.	*Africa.*	*S. E. Asia.*
Neobeliscus.	———	———
Obeliscus.	Euonyma.	Tortaxis.
Rhodea.	———	———
? Synapterpes.	———	———

So far as we know, there is little reason to separate *Obeliscus, Euonyma* and *Tortaxis* generically; yet their wide geographic separation makes such segregation useful, pending an investigation of the soft anatomy.

The anatomy of *Neobeliscus* has been described in some detail in the text. The teeth of *Obeliscus* are described below. Nothing is known of the soft parts of the other genera.

The radula of *Obeliscus obeliscus* (pl. 51, fig. 9) resembles

very closely that of *Neobeliscus*. Like the young *Neobeliscus*, there is a small cusp on the middle tooth, but no overhanging cutting point. The lateral teeth are like those of *Neobeliscus*, all being tricuspid. Marginal teeth not seen, the radula examined being fragmentary, taken from the remains washed from a dry shell.

ACHATINIDÆ [Continued].

Genus BACILLUM Theobald.

Bacillum Theobald in Hanley and Theobald, Conchologia Indica, p. 17, for *Achatina obtusa* Blanf. and *A. cassiaca* Bens.—*Achatina, Glessula* and *Stenogyra* of various authors.

Shell rather large, solid, imperforate turrited, many-whorled, a little contracted near the obtuse, rounded summit, the embryonic shell cylindric; sculpture of vertical rib-striæ beginning somewhere upon the first whorl (pl. 1, fig. 12); the post-embryonic whorls being obliquely, regularly rib-striate. Aperture oblique, Achatinoid, the columella concave, truncate at the base, outer lip simple. Internal axis slender, strongly sigmoid within each whorl. Soft anatomy unknown. Type *B. cassiacum.*

Distribution, eastern India. Figured on plate 1.

This group would hardly be thought distinct from *Homorus* were it not well separated geographically from that African genus, at least in the recent fauna. Almost the sole distinguishing feature is the stronger sculpture of *Bacillum.* Both groups are merely large and solid forms of the *Subulina* type, so far as the shells are concerned.

1. B. obtusum (Blanford). Pl. 1, fig. 1.

Shell elongate-turrited, whitish corneous, waxy, rather solid, closely flexuously plicate-striate, plicate under the suture. Spire lengthened, subcylindric towards the apex, which is very obtuse and papillar. Suture slightly impressed, somewhat crenulated. Whorls 12 to 14, nearly flat, the last subangulate at the periphery. Aperture oblique, subovate; peristome simple, unexpanded. Length 48 to 52, diam. 10 to

11, length of aperture 10 to 11, width 5 to 5.5 mm.; apex 3 mm. wide (*W. T. Blanf.*).

Bhamo, Ava (Blanford).

Achatina (*Glessula*) *obtusa* Blanf., P. Z. S., 1869, p. 449. —Hanley & Theob., Conch. Ind., p. 17, pl. 36, f. 6.—Pfr., Monogr., viii, p. 290. Not *Achatina obtusa* Pfr., Monogr., ii, 281, which was originally described as a *Glandina*.

"Very close to *A. cassiaca* Bens., but distinguished by finer sculpture, narrower and less numerous whorls, and much more obtuse apex."

2. B. orthoceras (Godwin-Austen). Pl. 1, figs. 2, 3, 12.

"Shell very slender and elongate, pale gray or white, very finely and regularly ribbed throughout, very solid, apex blunt; whorls 13 to 14, slightly rounded, suture well impressed; aperture oblique, rounded below, outer lip sharply edged and continued as a well-developed callus upon the strong, thickened columellar margin. Length 2.32, major diam. 0.4 in." (*Godwin-Austen*).

Khasi Hills.

Glessula orthoceras G.-A., Journ. Asiat. Soc. Bengal, xliv, part ii, 1875, p. 2, pl. 1, f. 4.—*Achatina o.*, Pfr., Monogr., viii, p. 289.—*Stenogyra* (*Glessula*) *o.*, G. Nevill, Hand List Moll. Ind. Mus., i, p. 172.

"Abundant on the nummulitic limestone of the West Khasi Hills, particularly near Nongumlai, where the finest specimens were collected; a smaller variety occurred on the peak of Laudomodo on gneiss, and was not so solid. This species can be at once distinguished from *G. cassiaca* Bs. by its white color and by the absence of the dark brown epidermis that covers the latter; the whorls also are much more rounded, whereas in *cassiaca* they are nearly flat. It is very close to *G. obtusa* W. Blf., brought from Yunan by Dr. J. Anderson, but is altogether a larger shell and differs in its general form.

"Fine *Glessula cassiaca* I only found to the eastward in the Naga Hills, whence I suspect Griffith's specimens were obtained and sent to Benson, who imagined they were from the Khasi Hills" (*Godwin-Austen*).

A specimen before me measures: length 62, diam. 11, length of aperture 12.2 mm.; whorls 14. The apex is of the round-topped cylindric type. Initial three-fourths of a whorl smooth (worn in the specimen seen); fine vertical rib-striæ then set in. The third and fourth whorls do not increase in diameter over the second; but with the fifth a regular but slow increase begins. This specimen (figs. 3, 12), agrees with the type description and figure except that the columella is less curved.

Nevill gives the following localities for specimens in the Indian Museum: Khasi Hills, Dafla Hills (Godwin-Austen); Assam, a young sinistral specimen (Stoliczka); and, doubtfully, Andamans, on the assertion of a native collector.

2*a*. *B. orthoceras austeni* n. subsp. Pl. 1, fig. 4.

Shell with the gray color, deficient cuticle and convex whorls of *B. orthoceras*, but much more rapidly tapering, the last whorl being much wider; striation coarser. Spire straightly tapering, very slender above. The early whorls are broken from the type specimen, 9½ remaining. Length (broken) 53.8, diam. 12, length of aperture 12.5 mm.

Naga Hills (coll. A. N. S. P., from a London dealer).

In a similarly broken specimen of *B. cassiacum* of about the same length as the type of *Austeni* there are eleven whorls remaining, and the shell measures: length 52, diam. 10, length of aperture 11 mm.

3. B. CASSIACUM ('Bens.' Rve.). Pl. 1, figs. 5, 6, 7.

Shell elongate-subulate, solid, closely and rudely obliquely plicate; white, covered with an olivaceous-brown cuticle. Spire lengthened, the apex subpapillar. Whorls 14 to 15, flattened, the last subangulate peripherally. Columella strongly arcuate, abruptly truncated. Aperture subrhombic-semioval; peristome simple, unexpanded. Length 64, diam. 12, aperture 13x7 mm. (*Pfr.*, from spec. in Benson coll.).

Naga Hills; Toruputu, 7,000 ft. (Godwin-Austen).

Achatina cassiaca Bens. mss., REEVE, Conch. Icon., v, pl. 17, f. 85 (June, 1849).—PFR., Monogr., iii, p. 499; iv, 615;

vi, 234; Conchyl. Cab., p. 310, pl. 25, f. 1.—Godwin-Austen, P. Z. S., 1872, p. 517, foot-note.—*Electra casiaca* Bens., Hanl. & Theob., Conch. Ind., pl. 36, f. 5.—*Glessula casiaca* G.-Aust., Journ. Asiat. Soc. Beng., xliv, pt. 2, 1875, p. 3.—*Stenogyra* (*Glessula*) *casiaca* Bens., Nevill, Hand List Moll. Ind. Mus., i, 172.

In 1872 Godwin-Austen stated that "the type of *A. casiaca* in Benson's collection is a shell I obtained in the Naga Hills, but never in the Khasi;" the latter being a different species, which he described in 1875 as *Glessula orthoceras*. The locality "Cassia Hills" given by Reeve on Griffith's authority is erroneous.

A small specimen stated to be from the N. Cachar Hills, is figured, pl. 1, figs. 6, 7. It measures: length 52, diam. 10, length of aperture 11 mm. The apex is broken. Fig. 5 is a copy of Reeve's type figure.

4. B. theobaldi (Hanley). Pl. 1, fig. 8.

"Differs from *A. cassiaca*, of which it has been considered a variety, by its smoothness, more convex whorls, etc." (*Hanl. & Theob.*).

Near the Salwin river, Shan States (Fedden).

Achatina theobaldi Hanley in Hanley & Theob., Conch. Indica, p. 9, pl. 17, f. 5.—Pfr., Monogr., viii, p. 290.—*Achatina* (*Glessula*) *theobaldiana* Hanley, Theobald, J. A. S. B., xxxix, 1870, p. 395.—*Stenogyra* (*Glessula*) *theobaldiana* Hanl., Nevill, Hand List, p. 172.

No full description of this species has been published.

5. B. erosum (Blanford). Pl. 1, figs. 9, 10, 11.

Shell long-turrited, rather thick, but little shining, hardly diaphanous, longitudinally obliquely striate, covered with a brownish straw-colored epidermis. Spire turrited, the sides a little convex, apex truncate, the apical whorls wanting, 7 nearly flat ones remaining; upper whorls more or less denuded and worn; suture impressed. Aperture oblique, angular behind, milk-white within. Peristome simple, acute. Columella lightly arcuate, obliquely truncate at the base (*Blanf.*).

Length 35, diam. 10, aperture 10x5 mm.

Length 36, diam. 10.5, aperture 10x5 mm.

Length 34, diam. 9, aperture 9x5 mm.

Darjeeling, in forest at the waterfall (Stoliczka).

Glessula erosa Blanf., Journ. Asiat. Soc. Bengal, xl, 1871, p. 43, pl. 2, f. 7, 7*a*.—*Achatina e.*, Hanley & Theob., Conch. Ind., pl. 78, f. 5.—Pfr., Monogr., viii, p. 283.

"This species is easily distinguished from its local associate *G. tenuispira* Bens. by its thickness and opacity, and by the character of the surface, which has none of the vitreous lustre so characteristic of most species of the genus. The upper whorls are generally much eroded; the lower, which retain the epidermis, are of a dark straw-color with darker oblique bands at intervals, apparently marking stages of growth. Under a lens very fine dark spiral lines are also perceptible" (*Blanford*).

Genus TORTAXIS Pilsbry, n. gen.

Spiraxis, Euspiraxis and *Stenogyra*, in part, of authors.

Shell Stenogyroid, rather large, imperforate or narrowly rimate, turrited or cylindric-turrited with large, obtuse (but not bulbous or cylindric) apex, the first two whorls smooth, the rest glossy, rather weakly striate, convex. Aperture ovate, the outer lip simple or with expanded edge, columella concave above, having a spiral callous fold below, obliquely or vertically truncate at the base. Type *T. erectus* (Bens.).

Distribution, southern China, Tonkin and Laos.

Most of the species are figured on plate 2.

This group differs from *Prosopeas* chiefly by the shape of the columella. The shell is also smoother and less attenuate above, and the growth-striæ bend forward less. It is not closely related to the true American *Spiraxis*.

These snails are apparently viviparous. A young shell out of *T. lubricus* is globose, of 2½ whorls, umbilicate, with a short, concave columella which is obliquely truncated, *Achatina*-like at the base. Diam. and alt. 2 mm. (pl. 12, fig. 1).

Stenogyra pachygyra Gredler, which has much the contour

of *Tortaxis,* was later shown to be an *Elma,* family Streptaxidæ (Nachrbl. D. Mal. Ges., 1890, p. 148).

The axis is but slightly sinuated in the whorls of the spire, not strongly so as in *Bacillum.*

1. T. SUPERBUS Mlldff.

Shell rimate, rather ventricosely turrited, rather solid, obliquely curved striatulate and decussated with spiral lines, greenish-yellow; apex obtuse. Whorls 9, a little convex, noticeably increasing, the last inflated, not descending. Aperture oblique, truncate-oval; peristome a little expanded, very much thickened, the columellar margin dilated, not truncated or twisted below. Length 40, diam. 11.5, aperture 10x 7.5 mm. (*Mlldff.*).

China: Heng-shan-hsien, prov. Hunan (Fuchs).

Stenogyra (*? Opeas*) *superba* MLLDFF., Nachrbl. d. m. Ges., 1888, p. 44.

By the umbilical crevice and shape of the columella this appears to belong to the section *Opeas,* but it differs widely from the typical species of that group by the great size and thick peristome (*Mlldff.*).

2. T. PALUS (Heude). Pl. 12, figs. 2, 3.

Shell of moderate size, long-turriculate; spire strongly attenuate, long-conic. Whorls 14, flattened, the upper margin crenulate, joined by a scalar suture, the last acute at the base. Aperture oval. Length 28, diam. 6 mm. (*Hde.*).

China: Kuang-si.

Stenogyra palus HDE., Notes sur les Moll. terr. de la Vallée du fleuve Bleu, p. 151, pl. 38, f. 25.

The generic position of this form is uncertain.

3. T. CHINENSIS (Pfeiffer).

Shell oblong-turrited, thin, under a lens seen to have hair-like striæ, glossy, pellucid, waxen-hyaline. Spire lengthened, the apex rather obtuse, whorls 6, moderately convex, the last one-third the total length, somewhat tapering basally. Aperture subvertical, oblong. Columella callous, somewhat

twisted, almost vertically truncate at the base. Peristome simple and thin. Length 7, diam. 2.5, aperture 2.33x1.5 mm. (*Pfr.*).

Shanghai, China (Fortune, in Mus. Cuming).

Achatina chinensis Pfr., P. Z. S., 1854, p. 294; Monographia, iv, p. 614.

This small species has not been figured. It seems from the "almost vertically truncate columella" to be a *Tortaxis* rather than a *Subulina*. According to von Moellendorff, the species reported by Fortune and others from "Shanghai" really came from the tea district in the interior of the province.

Compare also *Opeas layardi* etc., which may be the nearest allies of this species.

4. T. mandarinus (Pfeiffer). Pl. 2, figs. 27, 28, 29.

Shell imperforate, cylindric-turrited, rather solid, smooth, glossy, buff-waxen. Spire long, the apex attenuate, obtuse; suture margined. Whorls 8, the first rounded, the rest moderately convex, last whorl about one-fourth the total length, rounded basally; columella callous, twisted, subduplicate. Aperture oblique, elliptic-oval; peristome simple, unexpanded, the right margin arching forward above. Length 23, diam. 6 mm., aperture scarcely 6 mm. long, 3.5 wide (*Pfr.*).

China (Mus. Cuming). Province Kuang-tung (Gredler).

Spiraxis mandarina Pfr., P. Z. S., 1855, p. 9; Monogr., iv, p. 573.—*Stenogyra* (*Euspiraxis*) *m.*, Gredler, Malak. Bl., ix, p. 142.

This species has not hitherto been figured. Specimens said to be from Canton are before me, two being figured on my plate. The shell differs from *T. erecta* var. *fuchsiana* by its more slender shape, shorter aperture, and the form of the columella, which in profile (fig. 29) appears doubly plicate. Two specimens measure:

Length 22, diam. 6.1, aperture 6.2 mm.; whorls 8.

Length 28, diam. 7, aperture 7 mm.; whorls 9.

5. T. erectus (Benson). Pl. 2, figs. 24, 25, 26.

Shell whitish, rather solid, subulate-turrited, epidermis

dirty, scabrous. Whorls 8, planulate, the suture impressed; apex obtuse (*Bens.*).

Middle and southern China: Chusan, in company with *Clausilia aculus*; Macao (Dr. Cantor); Siam.

Achatina erecta BENSON, Ann. and Mag. N. H., ix, August, 1842, p. 487.—REEVE, Conch. Icon., pl. 16, f. 69.—PFR., Monogr., ii, p. 265; iii, 500; iv, 573; vi, 190; Conchyl. Cab., p. 333, pl. 28, f. 6, 7; P. Z. S., 1855, p. 9.—*Stenogyra erecta* MARTENS, P. Z. S., 1860, p. 9?;Ostas. Zoöl., p. 52, 83 (Siam).—NEVILL, Hand List Moll. Ind. Mus., i, p. 164 (Shanghai, *Tonnerre*).—MLLDFF., Jahrb. D. M. Ges., viii, 1881, p. 302, 304 (Canton).—MORELET, Journ. de Conchyl., 1889, p. 128 (Ajuthia, Siam).—GREDLER, Mal. Bl. (n. F.), ix, 1887, p. 142.—*Spiraxis erectus* Bens., FISCHER & DAUTZ., Mission Pavie Indo-Chine, iii, p. 411.

Benson's very incomplete description is given above. The shell is imperforate, cylindric-turrited, with a very obtuse apex; rather solid though thin, straw-colored or greenish-yellow, but slightly translucent, very glossy, sculptured with arcuate and rather weak growth-wrinkles. Whorls 7½, moderately convex. Apex rounded, smooth. Aperture oblique, ovate, the outer lip acute, arched forward just below the upper insertion. Columella strongly concave above, white-calloused below, and obliquely truncated at the base, the truncation vertical. Length 20.7, diam. 6 mm., length of aperture 6 mm.

It is wider and less elongated than *T. mandarinus* or *T. lubricus* and is more cylindric and more delicate than *T. mirus*. Specimens from Kuang-tung sent by Mr. B. Schmacker are larger than the form considered typical of *erecta* by Reeve and Pfeiffer, with 8½ strongly convex whorls. One is figured in pl. 2, figs. 24, 25. The lip is obtuse, though not thickened outside. Specimens measure: length 24.5, diam. 6.8, aperture 6.7 mm.; length 24, diam. 6.7, length of aperture 6.9 mm.

6. T. MIRUS (Gredler). Pl. 2, fig. 18.

Shell imperforate, turriculate, rather solid, irregularly

striatulate, more strongly so at the suture, glossy and translucid, pale greenish-yellow. Apex obtuse. Whorls 9, convex, the last slightly tapering to the base, suture deep. Aperture quadrilateral-ovate, oblique. Peristome a little expanded, thickened, the columellar margin short, adnate, arcuately receding; columella twisted, not truncate at the base, though angularly channelled. Length 28, diam. 7.75, aperture alt. 7, width 4 mm. (*Gredl.*).

China: a mountain near Yin-tchu-fu (or Hen-tchu-fu), Hunan (Fuchs).

Stenogyra (*Euspiraxis*) *mira* Gredl., Jahrb. D. M. Ges., xi, 1884, p. 146, pl. 3, f. 3; Mal. Bl. n. F., ix, 1887, p. 142.—Ancey, Bull. Soc. Malac. France, ii, 1885, p. 133, with var. *megeana*.—*Stenogyra fuchsiana* Heude, Notes Moll. terr. Vallée fleuve Bleu, p. 117, pl. 30, f. 16 (1884).

"This largest of the Chinese species is distinguished by its unusual size, and more by the twisted axis which recalls *Achatina*, and by the nearly quadrangular aperture."

Mr. Ancey has commented upon specimens from Kuang-yien-shien, prov. Setchuan, measuring 27x8 mm., noting that Gredler's figure is defective in that the spire is shown too much attenuated and the apical whorls too small. I have not seen topotypes, and therefore hesitate to criticize Gredler's figure, which I have copied, pl. 2, fig. 18.

6*a*. Var. *fuchsianus* Heude. Pl. 2, figs. 19, 20, 21, 22.

The specimens before me (pl. 2, figs. 19, 20) are from Heng-Shan-Hsien, prov. Hunan, received from B. Schmacker. Two measure as follows:

Length 27, diam. 8, length of aperture 8 mm.

Length 28, diam. 8, length of aperture 8 mm.

There are 8½ convex whorls. The aperture is oblique, the outer lip only perceptibly arched forward below the upper insertion, the edge being narrowly expanded. There is a narrow umbilical slit behind the reflexed columellar lip. The surface is greenish-yellow, sculptured weakly with growth-wrinkles, which are hardly noticeably stronger below the suture. The apex is much larger than figured by Gredler for

mira. These specimens are apparently the same as those commented on by Mr. Ancey and those described by Heude as *Stenogyra fuchsiana*, and differ from *mira* in the larger apex, perforate axis, larger aperture, etc.

Heude's type (pl. 2, figs. 21, 22) measured 27x9 mm., with 8 whorls, and was from Pao-k'ing-fu, in southern Hunan, collected by Fuchs.

6*b*. Var. *megeanus* Ancey differs from the type by the smaller size, shorter form and number of whorls. Length 25, diam. 8, alt. aperture 7 mm., whorls 9 (*Ancey*).

Kuang-Yien-Shien, prov. Setchuen, China (Abbe Mege).

7. T. PERMIRUS (Ancey). Pl. 2, figs. 15, 16, 17.

Shell solid, imperforate, elongate-turrite, with an oily gloss. Spire regularly conic-tapering, the apex obtuse. Whorls 10, regularly increasing, parted by an impressed suture, the first smooth, the rest ornamented by obsolete striæ more distinct at the suture. Last whorl hardly ascending, tapering below. Aperture distinctly oblique, irregularly oval, narrowed at both ends, angular above. Columella thick, a little arcuate, then twisted-plicate, nearly vertically truncate, and forming an angle with the base. Lip thickened, obtuse, subpatulous, the margins remote, joined by a strong and adnate callus. Color greenish-corneous, the apex a little paler, peristome white. Length 32, diam. 10, aperture 10 mm. high, 7 wide (*Ancey*).

Tonkin: That-Khe (Messager).

Spiraxis permira ANC., Journ. de Conch., li, 1903, p. 219, pl. 9, f. 17-20, with var. *multiplicata* Anc., p. 220, pl. 9, f. 21, 22.

This species especially approaches *S. mira* Gredler of Hunan, but the aperture is more ample, the columella less arcuate, less abruptly truncate, etc. (*Anc.*).

7*a*. Var. *multiplicatus* Anc. Pl. 2, fig. 23.

Differs from the type by its more strongly longitudinally striate or even plicate surface.

8. T. PILSBRYI (Ancey). Pl. 2, figs. 13, 14.

Shell rather solid, imperforate, lengthened-turrited, little

shining. Spire much produced and long-tapering, the apex large and obtuse. Whorls 11, a little convex, the first smooth, the rest ornamented with close, slightly oblique, irregular, longitudinal striæ, plicate at the suture. Suture impressed and lacerated by the plicæ. Last whorl oblong, tapering above. Aperture distinctly oblique, oblong, tapering above, the margins joined by a glossy callus. Columella at first arcuate above, posteriorly thickened and vertically truncate-plicate. Lip arcuate, acute but a little thickened, but without marginal lip. Color greenish-corneous. Alt. 33, diam. 8, aperture 7 mm. high, 5 wide (*Anc.*).

Tonkin: Bac-Kan and That-Khe (Messager).

Spiraxis pilsbryi Anc., Journ. de Conch., li, 1903, p. 218, pl. 9, f. 15, 16.

This species is distinguished by the more cylindric form, more narrowly lengthened, its aperture less high, and its peristome not so much thickened (*Anc.*).

9. T. lubricus (Dautzenberg). Pl. 2, figs. 30, 31.

Shell imperforate, thin but rather strong, yellowish-corneous, slightly translucent, cylindric-turrited, the apex very obtuse. Whorls fully 9, quite convex, the apex rounded, rather large, first two whorls smooth, the rest striatulate, the striæ a trifle stronger and retracted near the suture. Aperture small, ovate, slightly oblique, the outer lip thin; arched forward above. Columella concave above, then convex and calloused, obliquely truncate below.

Length 23.5, diam. 6, length aperture 5.9 mm.; whorls 9¼.

Length 23, diam. 5.7, length aperture 5.8 mm.; whorls 9¼.

Length 20, diam. 5, length aperture 5.3 mm.; whorls 8½.

Tonkin, near Haiphong.

Described and figured from specimens supplied by Mr. Dautzenberg, but I have been unable to find the original description. It is a more slender, lengthened shell than *T. erectus*; narrower and more cylindric than *T. mandarinus*.

A young shell fell out of one of the specimens. It is globular, about 2 mm. diam. and alt., with strongly truncate columella (pl. 12, fig. 1).

10. T. PFEIFFERI (Menke). Pl. 4, figs. 21, 22.

Shell oblong-turrited, rather solid, lightly striate, but little shining, waxy-buff. Spire long, the apex obtuse, suture moderately impressed. Whorls 8, equally and slightly convex, the last slightly exceeding a fourth the total length, base slightly tapering. Columella white-calloused, slightly twisted. Aperture suboblique, elliptical-oval; peristome simple, unexpanded, the right margin dilated forward. Length 19, diam. 5.5, length of aperture 5, width 3 mm. (*Pfr.*).

Touranne, Cochin China; Annam (Fruhstorfer).

Spiraxis pfeifferi MKE., Malak. Bl., iii, 1856, p. 68.—PFR., Novit. Conch., i, p. 103, pl. 29, f. 7, 8; Monogr. Hel. Viv., iv, 573.—*Prosopeas p.*, MLLDFF., Nachrbl. D. Malak. Ges., 1900, p. 134.

11. T. SERVAINI (Mabille). Pl. 4, fig. 6.

Shell oblong-subcylindric, hyaline, delicate, rather solid, glossy, slightly striatulate under a lens. Spire elongate, the apex obtuse, mamillate. Whorls 8, convex, separated by an impressed, narrowly margined suture, the last whorl cylindric, nearly one-third the total length, rather swollen basally, slightly tapering. Aperture subvertical, ovate, angular below; columella a little thickened, arcuate, slightly and obliquely truncate at the base; outer margin a little curved forward; parietal callus very thin. Length 20, diam. 6 mm. (*Mab.*).

Tonkin (Balansa).

Subulina servaini J. MABILLE, Moll. Tonk. diagn., p. 10 (May 14, 1887); Bull. Soc. Malac. France, iv, 1887, p. 104, pl. 4, f. 13.

The original figure, which I have copied, is evidently so poor as to be practically worthless.

Genus PLICAXIS Sykes, 1903.

Plicaxis SYKES, Journal of Malacology, x, p. 1, March 31, 1903.—? *Rhodina* DE MORGAN, Le Naturaliste, May, 1885, p. 68. Not *Rhodina* Guenée, 1854.

Shell imperforate, dextral, cylindric, striate, the early

whorls smooth, apex obtuse; whorls numerous (10-13 in known species). Aperture irregularly piriform, the columella excavated below, prominent at its junction with the parietal wall. Soft anatomy unknown.

Type *P. mirabilis*. Distribution, Perak, Malay Peninsula.

No definition of this group has been published by Mr. Sykes, but its special character seems to be the presence of a prominence on the axial border, invading the aperture. In *P. mirabilis* the columella seems to be slightly twisted, and the parietal wall bulges above it; in *P. perakensis* the columella seems to describe a wide spiral gyration. Otherwise the shell is like *Prosopeas*. The two species seem from the published figures to differ in columellar structure, and that they belong together is not at all certain.

1. P. MIRABILIS (Sykes). Pl. 4, figs. 1, 2.

"Shell recalling in form *Rhodina perakensis* de Morgan, but the earlier whorls increase more rapidly, and the lower half of the shell has a more cylindrical appearance. The columella is twisted, and a revolving keel encircles the base and ascends spirally into the shell, about half way up the columella wall; in addition, another keel is visible from the junction of the suture line and the outer lip until, revolving round the periphery, it fades out where it bisects the outer lip. Whorls 13, earlier ones smooth, later ones strongly striate. Alt. 24.5, diam. max. 3.5 mm." (*Sykes*).

Malay Peninsula: Kelantan (J. Waterstradt).

Rhodina (?) *mirabilis* SYKES, Journal of Malacology, ix, 1902, p. 22; *t. c.*, p. 61, pl. 3, f. 2; x, p. 1.

This species is the type of the genus *Plicaxis*, though Mr. Sykes did not actually use the combination *Plicaxis mirabilis*.

2. P. PERAKENSIS (de Morgan). Pl. 4, figs. 3, 4, 5.

Shell cylindric, subulate, fragile, brown, corneous, composed of 10 regularly convoluted whorls; striæ of growth very well marked and irregular; suture linear and very strongly impressed. Aperture triangular, oblique, at an angle of about 30 degrees with the axis of the shell; peristome straight

and thin; columellar margin much reflexed. Length 25, diam. in the middle 3.5, diam. of the last whorl 4.5 mm.; length of aperture 5, width 3 mm. Color corneous-yellow (*de Morg.*).

Perak: Mt. Tchora, near Ipoh (Kinta), among dead leaves gathered between limestone blocks, one specimen (*de Morg.*).

Rhodina perakensis DE MORGAN, Le Naturaliste, iii, 7e année, May, 1885, p. 68; Bull. Soc. Zoöl. France, x, 1885, p. 390, pl. 6, f. 9.

Genus PROSOPEAS Mörch, 1876.

Prosopeas MÖRCH, Journ. de Conchyl., 1876, p. 358, for *Bulimus roepstorfi* and *B. achates*.

Shell Stenogyroid, of moderate or large size, imperforate or nearly so, with rather small, semiglobose apex, the first 2 whorls typically smooth (but ribbed in the s.-g. *Paropeas*), later whorls very *densely sculptured with fine oblique striæ which are arched forward above* and retracted to the suture. Aperture ovate, columella straight or concave, continuous with the basal margin below, slightly or not folded above, with a reflexed, adnate margin. Axis slender, straight or nearly so. Reproduction by globular, calcareous-shelled eggs, as in Opeas. Type *P. roepstorfi*.

Distribution, East Indies, Philippines, north to China.

The species are illustrated on plates 3, 4, 5.

Prosopeas as at present limited contains species of somewhat diverse structure, falling into three subsidiary groups:

1. *Prosopeas* s. str. First two whorls *smooth*, forming a rounded apex (pl. 4, fig. 8). *P. roepstorfi, P. tchehelense*, etc.

2. Section *Paropeas* Pils., n. s.-g. First two or two and a half whorls *vertically ribbed* (pl. 3, fig. 88), apex rounded; shell thin. *P. acutissimum* (type of the subgenus), *holosericeum, paioense, argenteum, lombockense*, etc.

3. Group of *P. haughtoni*. Large and solid, the apex rather conic, apparently ribbed, but worn in all the specimens seen. *P. haughtoni, P. pealei*, and perhaps *P. coehliodes* and the other large Philippean species, and *P. carolinum*.

Many of the descriptions do not mention the apical sculpture, and frequently in the larger forms it cannot be made out in adult shells owing to erosion; so that at present these characters cannot be utilized in the arrangement of the species. Most of those known from Lombock, Java and Sumatra belong to the subgenus *Paropeas*, while further north *Prosopeas* proper predominates.

Opeas hedeius and *O. fagoti* of Mabille, described from Tonkin, may belong to *Prosopeas*, but they have not been figured and their position is uncertain.

Distribution of Species of Prosopeas.

Philippine species: *P. suturale*, no. 1; *P. cochliodes*, no. 2; *P. rhodiniforme*, no. 3; *P. elongatulum*, no. 4; *P. pagoda*, no. 5; *P. quadrasi*, no. 6; *P. romblonicum*, no. 7; *P. macilentum*, no. 8.

Caroline Is.: *P. carolinum*, no. 9.

East Indian species:

Moluccas: *P. elongatulum*, no. 4.

Celebes: *P. gorontalensis*, no. 10.

Lombock: *P. lombockense*, no. 12; *P. discernibilis*, no. 11.

Java: *P. achatinaceum*, no. 13; *P. acutissimum*, no. 14; *P. hochstetteri*, no. 15; *P. holosericum*, no. 16.

Sumatra (including Enganio): *P. holosericum*, no. 16; *P. paioense*, no. 18; *P. laxispira*, no. 19; *P. argenteum*, no. 17.

Nicobar Is.: *P. roepstorfi*, no. 20; *P. achates*, no. 21.

Andaman Is.: *P. haughtoni*, no. 22; *P. pealei*, no. 23; *P. walkeri*, no. 24.

Asiatic species, Malay Peninsula to Burma: *P. walkeri*, no. 24; *P. turricula*, no. 25; *P. terebralis*, no. 26; *P. tchehelense*, no. 27; *P. swettenhami*, no. 28; *P. hebes*, no. 29.

Anam, Laos, Tonquin: *P. anceyi*, no. 30; *P. henrici*, no. 31.

Hainan: *P. teres*, no. 32.

China: *P. decorticatum*, no. 33; *P. striatissimum*, no. 34.

1. P. SUTURALE Moellendorff. Pl. 5, figs. 23, 24.

Shell nearly subrimate, long-turrite, thin, glossy, corneous-

whitish; spire turrited, the sides very slightly convex, the apex rather acute. Whorls 8½, very slowly increasing, separated by an impressed, submargined suture, the upper ones somewhat convex, the later whorls flat in the middle, striatulate, the striæ oblique, sigmoid; last whorl one-third the shell's length. Aperture oblique, semioval; peristome simple, acute, the right margin somewhat protracted above, columellar margin oblique, somewhat straightened, and closing the umbilical crevice with a distinct callus. Columella slightly twisted, obliquely entering, the median part flattened, base slightly emarginate, not truncate. Length 50.5, diam. 8.12, aperture 9.5 mm. long, width (including callus) 5 mm. (*Mlldff.*).

Cebu: village of Tuburan, on the west coast.

Prosopeas suturale Mlldff., Bericht Senck. Nat. Ges., 1890, p. 246, pl. 8, f. 10.

Related to *P. pagoda* Semp. of Montalban, from which it differs by the smaller number of whorls of full-grown shells, convexly-turrited shape, higher and broader shell, and by having no angle between columellar and basal margins of the mouth. Like other species of this difficult group, it varies in the relative width of the shell. A specimen was found only 7.37 mm. wide with a length of 30.5. Another is 8.25 wide, length 25.5 mm.

2. P. cochliodes (Pfeiffer). Pl. 5, figs. 25, 26, 27.

Shell imperforate, turrited, solid, obliquely regularly striate, whitish; apex rather obtuse; suture impressed. Whorls 9, rather flattened, the last one-fourth the total length. Columella somewhat thickened. Aperture oblong-oval; peristome simple, unexpanded. Length 48, diam. 12, aperture 12.5x6 mm. (*Pfr.*).

Philippines: Cuyo (Cuming). Sibuyan (Mlldff.). Tablas (Mlldff., subsp. *planogyra*).

Bulimus cochliodes Pfr., P. Z. S., 1842, p. 151; Monogr., ii, 152.—*Bulimus cochleades* Reeve, Conch. Icon., v, pl. 14, f. 82.—*Prosopeas c.*, Mlldff., with mut. *extensa* Mlldff. and subsp. *planogyra* Mlldff., Abhandl. Nat. Ges. Görlitz, xxii, 1898, p. 155.

In this large, solid species the early whorls are usually worn in adults. I do not know whether they are costulate or not. The columella in adult but not aged shells is narrow and nearly straight, as usual in Prosopeas, but in old shells it becomes very thick inwardly, and tapers strongly to the base. The aperture is quite oblique. Three specimens from Sibuyan (pl. 5, figs. 26, 27) measure—

Length 42, diam. 10, length aperture 11.5 mm., whorls 9½.

Length 44.5, diam. 9.5, length aperture 11 mm., whorls 10½.

Length 37.5, diam. 9.5, length aperture 11.3 mm., whorls 9.

Reeve's figure is copied, fig. 25. The varieties mentioned by von Moellendorff have not yet been described.

3. P. RHODINÆFORME Moellendorff.

Shell not rimate, slenderly cylindric-fusiform, thin, subpellucid, delicately striate-silky, pale straw-colored. Whorls 10, rather rapidly increasing, parted by slightly impressed sutures, flattened, the last and penultimate nearly equal in height. Aperture moderately oblique, drop-shaped; peristome simple, acute, the right margin strongly arcuate. Columella not truncate, callous, well arched below, strongly twisted above, elevated like a lamella, spirally receding.

Length 33.5, diam. 6.5 mm.

Length 28, diam. 7 mm. (*Mlldff.*).

Sibuyan (C. Roebelen); Tablas.

Prosopeas rhodinæforme MLLDFF., Nachrbl. D. Mal. Ges., xxvi, p. 115, August, 1894.

4. P. ELONGATULUM (Pfeiffer). Pl. 5, figs. 28, 29.

Shell imperforate, subulate, rather solid; under a very thin cuticle it is striate, sometimes obsoletely decussate, white; spire subulate, acute. Whorls 8, flattened, the last nearly one-third the length. Columella slightly receding, callous, flat. Aperture oblong-oval; peristome simple, the right margin somewhat arched forward; columellar margin receding, somewhat thickened, appressed. Length 24, diam. 5.66, length of aperture 7, width 3.33 mm. (*Pfr.*).

Luzon: Calanang (Cuming). Mareh, in the Ternate group of the Moluccas (Martens).

Bulimus elongatulus Pfr., P. Z. S., 1846, p. 42; Monogr., ii, p. 154; iii, 391; iv, 453; vi, 91; Conchyl. Cab., p. 197, pl. 30, f. 5, 6.—Reeve, C. Icon., v, pl. 14, f. 80.—*Stenogyra e.*, Martens, Ostas. Zoöl., Landschn., p. 373; Jahrb. D. M. Ges., ii, 1875, p. 83, footnote.—*Prosopeas e.*, Mlldff., Verzeichniss, p. 155.

5. P. pagoda (Semper).

Shell imperforate, subulate, glossy, lightly striatulate, yellowish, hyaline; apex obtuse. Whorls 7 to 7½, nearly flat, gradually increasing, the last tapering below. Aperture subvertical, ovate-trigonal; columellar margin almost straight, somewhat callous below, subtruncate, not reflexed at the insertion. Length 16-19, diam. 5-5.5, alt. of aperture 6-6.5, width 3 mm. The penult. whorl is to the last as 1:1¾ (*Semper*).

Northern Luzon (Semper). Montalban (Mlldff.).

Stenogyra pagoda Semper Reisen im Archipel der Philippinen, iii, p. 138.

6. P. quadrasi (Hidalgo). Pl. 5, figs. 30, 31.

Shell subimperforate, long-turrited, narrow, thin, slightly striatulate, subpellucid, whitish (corneous?). Spire much lengthened, the apex obtuse, submamillar; suture impressed. Whorls 11, wide, rather flattened, the last one-fifth the total length, somewhat tapering basally; columella thread-like, lightly arcuate. Aperture ovate-acute, the base rounded; peristome simple, straight. Length 19.5, width 3.5 mm. (*Hid.*).

Cagpayao, Gigaquit, Mindanao.

Stenogyra quadrasi Hid., Journ. de Conchyl., 1888, p. 35, pl. 6, f. 2.—*Prosopeas q.*, Mlldff., Verzeich., p. 156.

Larger than *Stenogyra panayensis* Pfr., with more whorls and a differently shaped aperture. It may be an *Opeas*.

7. P. romblonicum Moellendorff.

Shell imperforate, subcylindric-turrited, thin, pellucid, finely curved-striatulate, rather glossy, straw-colored. Spire tapering, the apex semiglobose. Whorls 7, flattened, the last somewhat subangular below the periphery. Aperture moder-

ately oblique, narrowly acuminate-oval; peristome simple, acute, the right margin curved forward above the middle. Columella slightly twisted, callously thickened. Length 15, diam. 4.6 mm. (*Mlldff.*).

Romblon.

Prosopeas romblonicum Mlldff., Nachrbl. D. M. Ges., 1896, p. 12.

8. P. macilentum (Reeve). Pl. 5, fig. 32.

Shell imperforate, oblong-turrited, very thin, smooth, pellucid, glossy, greenish-hyaline; spire turrited, obtuse. Whorls 6, slightly convex, the last about two-fifths the total length, rounded basally; columella straightened, somewhat callous. Aperture a little oblique, oblong-oval; peristome simple, unexpanded, the right margin very slightly arcuate. Length 12.5, diam. 4, aperture 5x2 mm. (*Pfr.*).

Philippine Is. (Cuming). Cebu (Mlldff.); also Luzon (Mlldff., var. *luzonicum*).

Bulimus macilentus Reeve, C. Icon., v, pl. 79, f. 586.—Pfr., Monogr., iii, p. 401.—*Stenogyra macilenta* Semper, Reisen, p. 139.—*Prosopeas macilentum* (Rve.), Mlldff., Bericht Senck. Ges., 1890, p. 247; Abhandl. Naturforsch. Ges. Görlitz, 1898, p. 156, with var. *luzonicum* Mlldff., undescribed.

The specimens taken in Cebu by Dr. von Möllendorff are a little larger, length 14, diam. 5, aperture 5.5x2.5 mm.

9. P. carolinum (Martens). Pl. 5, figs. 36, 37, 38.

Shell elongate, arcuately lightly striatulate, slightly shining, buff, apex obtuse. Whorls 7, nearly flat, with subgradate suture, close above which there is a band formed of a dark brown incrustation; last whorl noticeably tapering towards the base. Aperture scarcely one-third the total length, a little oblique, acutely angular above, dilated below the middle, the outer margin thin, unexpanded; columellar margin rather wide, obliquely arcuate, pale, acuminate below. Length 22, diam. 5.5, aperture 7x4 mm. (*Martens*).

Caroline Is.: Ruk, or Hogoleu (O. Finsch, Kubary).

Stenogyra carolina Marts., Sitzungsber Gesellsch. natur-

forschender Freunde, 1880, p. 147; Conchol. Mittheil., i, p. 93, pl. 17, f. 6-8.—*Prosopeas carolinum* (Marts.), Mlldff., Journ. of Malak., vii, p. 113.

The color, suture and obtuse apex give this species a certain similarity to *Tornatellina gigas*. It is referred to *Prosopeas* with some doubt.

10. P. gorontalensis (Sarasin). Pl. 5, figs. 33, 34, 35.

Shell large, drawn out very slim, imperforate with obtuse apex. Whorls 10, the uppermost somewhat convex, the rest nearly flat, separated by an incised suture, slowly and regularly increasing in breadth, the last whorl with the indication of an angle, tapering towards the base. Aperture narrowly piriform, acute above, rounded and effuse basally, the peristome acute, not reflexed, terminations connected by a flat callus, the columellar margin somewhat thickened and whitish. The sculpture consists of fine, closely crowded, raised, transverse striæ. The original color is no longer recognizable, the shells appearing pure white. Length 33.75, diam. 8, aperture 10x3.75 mm.; length 33.5, diam. 7.5, aperture 9.5x4 mm. (*Sarasin*).

Celebes: southern shore of Limbotto Lake in a bank of debris.

Stenogyra (*Prosopeas*) *gorontalensis* P. & F. Sarasin, Die Land-Mollusken von Celebes, p. 117, pl. 26, f. 270, 271, 271*a* (1899).

Smaller, more slender and thinner than *P. cochliodes* Pfr.

11. P. discernibilis (Martens). Pl. 5, fig. 39.

Shell turrited, subrimate, sculptured with subelevated, vertical, close and unequal striolæ, rather glossy, uniform yellow Apex obtuse. Whorls 9, the first small, scarcely projecting, second and third almost double its size, of equal width, subglobose, smooth; following whorls regularly and slowly increasing, nearly flat, striatulate, with slightly impressed sutures, the last whorl oblong, the lower third noticeably tapering. Aperture oblique, lanceolate, the peristome thin, unexpanded, the outer margin lightly arcuate, basal margin

narrowly rounded, columellar margin vertical, somewhat thick, tapering below and rapidly passing into the basal margin, outwardly expanded in a distinct parietal callus, leaving an extremely narrow umbilical fissure. Length 31, diam. 8.5, aperture 10x5 mm. (*Marts.*).

Lombock Island (Fruhstorfer).

Stenogyra discernibilis Marts., Sitzungsber. Ges. naturforsch. Freunde, Berlin, 1896, p. 162.—E. A. Smith, Proc. Malac. Soc. Lond., iii, p. 30, pl. 2, f. 13 (fig. of type).

"The height (length) of the visible part of the penult. whorl, on the back, has the proportion of 5:7½ to its width. The upper five whorls in grown examples are worn, dull and whitish, but in younger ones they are as glossy and yellow as the following ones. *S. lanceolata* Pfr. of Natal seems the most similar species of those known to me."

By its smooth early whorls this form might be a typical *Prosopeas*, but the sculpture of the later ones is not typical.

12. P. lombockense (Smith). Pl. 6, fig. 75.

Shell lengthened, slightly rimate, buff-gray, obliquely painted with white hydrophanous streaks, sculptured with delicate, close, subgranulous growth-lines. Spire elongate, very obtuse at the apex. Whorls 8, the upper three closely and strongly costulate, convex, the rest a little convex, parted by an oblique suture, the last whorl lengthened, a little narrowed in front. Aperture elongate, acute above, one-third the total length; lip thin, arched forward in the middle, the margins joined by a thin parietal callus; columellar margin straight, narrowly reflexed. Length 26, diam. 8 mm. (*Smith*).

Lombock Island (A. Everett).

Stenogyra lombockensis E. A. Smith, Proc. Malac. Soc. Lond., iii, p. 29, pl. 2, f. 14 (April, 1898).

"Differs from *S. discernibilis* Martens in sculpture, color, etc. The fine costulæ on the protoconch exhibit a very pretty crenulated appearance at the suture."

13. P. achatinaceum (Pfeiffer). Pl. 5, figs. 40, 41.

Shell imperforate, long-turrited, solid, closely, rudely stri-

ate, opaque, waxen. Spire elongate, rather acute. Whorls 8, a little convex, the last about one-third the length. Columella straightened, nearly reaching the base. Aperture oblong-oval; peristome simple, acute, the columellar margin very narrowly reflexed, adnate. Length 13, diam. 4.5, aperture 4.5x2.66 mm. (*Pfr.*).

Java (v. d. Busch, Zollinger). Sumatra at Palembang, at the tombs of the Sultans. Western Borneo at Singkawang, Bengkajang, Seminis and Mampawa, on dry, sandy ground, even near the sea (Martens). Saleyer (Weber).

Bulimus achatinaceus Pfr., Symbolæ, iii, p. 82; Monogr., ii, 156; iii, 393; iv, 454; vi, 92.—Reeve, Conch. Icon., v, pl. 67, f. 470.—Mousson, Die Land- und Süsswasser-Mollusken von Java, p. 35, pl. 4, f. 4 (1849).—*Stenogyra a.*, Martens, Ostas. Zoöl., p. 375, pl. 22, f. 9; Weber's Zoöl. Ergebn. Niederl. Ost-Ind., p. 243.—Issel, Moll. Borneo, p. 51.

14. P. acutissimum (Mousson). Pl. 3, figs. 85, 86, 87, 88.

Shell imperforate, subulate, closely and regularly transversely striate, the striæ a little curved; opaque, covered with a pale corneous cuticle. Spire long, acute, the suture deep. Whorls 8½, widely coiled, flattened, the last somewhat tapering, one-fourth the total length. Aperture oblong-oval, somewhat compressed above; peristome unexpanded, acute, the right margin somewhat arched forward, basal margin receding, subhorizontal, columellar margin straight, narrowly reflexed, somewhat truncate at the base. Length 23.5, diam. 5.5 mm. (*Mouss.*).

Buitenzorg, near the botanical gardens, Java (Zollinger, Weber). Gunung Salak (Strubell).

Bulimus acutissimus Mss., Journ. de Conchyl., 1857, p. 159.—Pfr., Monogr., iv, p. 453.—*Stenogyra a.*, Martens in Weber's Ergebn. einer Reise in Niederl. Ost.-Ind., ii, p. 243. —*Prosopeas a.*, Boettger, Bericht Senck. Ges. Frankfurt, 1890, p. 147.

Boettger reports specimens from Gunung Salak, Java, as with 9 whorls and 20-21½ mm. long, 5-5¼ wide, aperture 6¼, width 3⅛ mm. The spire is more acute than in *P. laxi-*

spirum of Sumatra, and the aperture longer proportionately. Specimens before me measure—

Length 23.7, diam. 5.5, length of aperture 7 mm., whorls 9¼.

Length 21, diam. 5, length of aperture 6.5 mm., whorls 9.

The first 2¼ whorls are vertically costulate, the riblets worn off on the convex shoulder of the whorls. The aperture is quite oblique, very narrow, and somewhat effuse basally. The columella and parietal wall are almost in a line, the angle at their junction being inconspicuous. The eggs are cream-white, globular and hard-shelled, 1.8 mm. in diameter.

14*a*. Var. *hastatum* Boettger, n. var. Pl. 3, figs. 89, 90, 91.

Shell somewhat larger and wider than *acutissimum*, the columellar callus heavier; aperture wider. Narrowly rimate. Length 26, width 6.2, length of aperture 7.7 mm.; whorls 9½; spire noticeably attenuated above.

Java. Types 78446 A. N. S. P.

15. P. HOCHSTETTERI (Zelebor).

Shell imperforate, oblong-turrited, solid, closely subrugulose-striate, white covered with a waxen cuticle. Spire a little convexly turrited, the apex minute. Suture simple. Whorls 7½, a little convex, the last two-fifths the total length, a little tapering basally. Aperture slightly oblique, acuminate-oval, whitish inside, glossy. Columella callous, receding, slightly folded above. Peristome simple, unexpanded, the margins joined by a thin callus. Length 19.5, diam. 6.5, aperture 8.3x3.3 mm. (*Zel.*).

Java ('Novara' cruise).

Bulimus hochstetteri ZELEBOR in Pfr. & Zelebor, Verh. zoöl.-bot. Ges. Wien, xvii, 1867, p. 806.—PFR., Monogr. Hel. Viv., vi, 107 (1868).

"This species is very similar in structure and sculpture to *B. acutissimus* Mouss., also from Java."

Since the "Novara" lay at Batavia for the greater part of May, 1858, and touched nowhere else in Java, it is likely that this species was taken in the neighborhood of that port.

16. P. HOLOSERICUM Boettger, n. sp. Pl. 3, figs. 93, 94.

Shell subrimate, slender, turrited, thin, pale greenish-corneous, very densely and finely striate, the striæ oblique, arched forward below the suture, the first 2½ whorls vertically costellate, usually worn. Whorls 8½, convex, the last two much less so, somewhat flattened. Suture narrow but deeply incised, oblique. Aperture narrow, oblique. Columella straight, with reflexed, not wholly adnate edge. Length 19.5, diam. 4.8, length of aperture 6 mm.

Java. Sumatra at Sukuranda (G. Schneider).

P. holosericum BTTG. in coll. Acad. Nat. Sci., no. 69973.—MARTENS, Nachrbl. D. Mal. Ges., 1900, p. 9 (no description).

This is apparently described here for the first time; or at all events, I have been unable to find a description of the species. It is a smaller shell than the closely related *P. acutissimum*, with the mouth narrower below, and the columellar reflection not wholly appressed, leaving a long but very narrow umbilical fissure.

17. P. ARGENTEUM Henderson. Pl. 6, fig. 71.

Whorls fully 8, slightly convex. Apex obtuse. Sutures well impressed. Aperture oblique, elongate, pointed above, dilated in the middle, narrow below. Lip sharp and thin; columella slightly arcuate; ends of lip connected by an exceedingly thin shining callous. Growth-lines closely crowded, strong and roughened. First or apical whorl regularly costulate. Color shining silvery-white, becoming yellowish toward the base. Length 23, diam. 6 mm. (*Henderson*).

Enganio Island, southwest of Sumatra (Wm. Doherty).

Prosopeas argentea HENDERSON, Nautilus, xii, p. 16, pl. 2, f. 10 (June, 1898).

"The Stenogyras are widely distributed throughout the Malayan province, being represented in all the islands by more or less closely allied species. This resembles *Opeas acutissima* Bttg. (*O. hastatus* Bttg.), of Java, in color and sculpture, but is less slender and has fewer whorls. It is a much larger shell than *O. achatinacea* Pfr., of Java. It differs from *Opeas paioensis* Bock, of Sumatra, in being a larger

shell with a smaller apex. *Stenogyra echelensis* de Morg., of Perak, bears a strong resemblance to this Enganio form'' (*Henderson*).

18. P. PAIOENSE (Bock). Pl. 5, figs. 42, 43.

''Shell elongate, subulate, imperforate, of a dirty grayish-white color, covered with a somewhat deciduous and coarsish olive epidermis. Whorls 12, apical ones obtuse, glossy, vitreous, these and the few succeeding rather convex and slowly enlarging, the five last proportionally longer and flatter, increasing more in length than breadth, and separated by a rather oblique deepish suture. Sculpture consisting of coarsish, oblique, flexuous, indistinctly subgranose, raised lines of increment. Aperture elongate, subpiriform, acute above, occupying rather more than one-fifth of the entire length of the shell. Outer lip (viewed laterally) oblique, a little excurved near the suture, simple, thin. Columella whitish, slightly arcuate and thickened, appressed to the whorl, connected with the extremity of the labrum by a very thin callosity. Length 40, diam. 7½, aperture 9 mm. long, 3 mm. broad'' (*Bock*).

Sumatra: Paio, in the Padang district, 1,500 feet above the sea (Bock).

Bulimus (*Stenogyra*) *paioensis* Bock, Proc. Zoöl. Soc. London, May, 1881, p. 630, pl. 55, f. 5.

''The animal is of a yellowish color, has a short foot, and carries its shell in an oblique position.

''I never met with this interesting species in any other spot in the highlands; and even at Paio it appeared to be rare; for in all, after close search, I found but fourteen specimens'' (*Bock*).

A specimen, probably one of the original lot, measures, alt. 33.8, diam. 6.5, length of aperture 9 mm. It is imperforate, very thin, whitish-corneous, composed of fully 11 whorls. The apex, though small, is obtuse and hemispherical, the next 4 or 5 whorls are convex, much wider than high, and increase the diameter of the shell rather rapidly; the *last 4 whorls are nearly flat, very high*, and increase the calibre of the shell very slowly. The sculpture consists of fine vertical riblets on

the first two or three whorls, the riblets weaker near the upper suture. On the later whorls the sculpture is of very fine, densely crowded striæ, quite oblique, and arched forward below the suture. Where fresh and unrubbed, there are minute and *delicate cuticular hairs arranged in spiral lines* on the striæ; when rubbed off, these hairs leave very slight depressions visible as weak spiral lines in a favorable light. The striæ and hairs hold a thin coating of earth, giving the shell the appearance of having a dull brownish cuticle. The columella is narrowly reflexed and adnate. The parietal callus is so thin as to be hardly visible.

P. paioense is related to *P. laxispirum*, but is larger, more robust, with a thinner parietal callus.

19. P. LAXISPIRUM (Martens). Pl. 3, fig. 92.

Shell imperforate, subulate, rudely striate, dull brown, opaque; apex very obtuse. Whorls 11, the first a little convex, subglobose, the following, from the fifth, flattened, elongate; suture very oblique, somewhat channelled, distinct; last three whorls subequal; base noticeably tapering. Aperture slightly oblique, narrowly piriform, the columellar margin white, reflexed and adnate throughout, passing above into a distinct parietal callus, slightly twisted below and obliquely subtruncate. Length 27 to 30, diam. 5 to 5.5 mm.; aperture 6 to 7.5 mm. high, 2.5 to 3 wide. Length of the visible part of the last whorl to the penultimate as 1 : 1½ or 1⅓ (*v. Marts.*).

Sumatra: mountains of the interior at Kepahiang, on the ground; not rare (*Marts.*).

Stenogyra laxispira v. MARTS., Ostas. Zoöl., Landschn., p. 373, pl. 22, f. 14 (1867).—*Bulimus l.*, PFR., Monogr., vi, p. 92.

Distinguished by the size, rough sculpture, want of an umbilical chink, distinct parietal callus, noticeable truncation of the columellar margin, but especially by the very slow increase of the individual whorls in height and width, therefore remaining almost equal. Only the upper whorls are wider than high, so far as their visible parts are concerned, the fifth to last being as high as wide, whereby the whole shell appears

very slender. The growth-striæ are somewhat arched forward. The description of Mousson's *Bul. acutissimus* applies in great part, but he gives only 8½ whorls for a specimen but little smaller, and terms the shell *regularly*, closely striate; moreover, the present shell cannot well be called "very acute" (*v. Marts.*).

20. P. ROEPSTORFI (Mörch). Pl. 3, figs. 97, 98, 99.

"Related to *Stenogyra elongatula* Pfr. (Martens, Ostas. Zoöl., p. 379, pl. 22, f. 12), but differing as follows: Shell straw-colored, costulate-striate, the sutures deep; aperture dilated, almost fig-shaped, white in the throat; columella twisted, imperforate. Length 22.5, diam. 6, length of aperture 7.5 mm." (*Mörch*).

Nicobar Is.: Kamorta (Roepstorf).

Bulimus (*Prosopeas*) *roepstorfi* MCH., Journ. de Conchyl., 1876, p. 358, 367.

I figure a specimen received as *P. roepstorfi*. There are nearly 8 whorls, the first globose and smooth, the rest moderately convex and sculptured with forwardly arcuate, thread-like striæ. The aperture is quite oblique, long and narrow, the thin outer lip arched forward, the columellar lip narrowly reflexed above and imperfectly appressed. The columella is concave, slightly folded at the upper insertion. Length 16, diam. 4.7, length of aperture 5.2 mm.

21. P. ACHATES (Moerch). Pl. 12, figs. 4, 5.

"Differs from *roepstorfi* by the smaller, short shell, covered-perforate. Length 14, diam. 5, length of aperture about 6 mm." (*Moerch*).

Kamorta, Nancouri, Nicobar Is. A variety from Kamorta and Nancouri is "smaller, smoothish, length 11, width 9, length of aperture 5 mm." Another from Nancouri is rather solid, length 13, width 4.16 mm., aperture 4 mm.

Bulimus (*Prosopeas*) *achates* MOERCH, J. de Conch., 1876, p. 359.

Mörch places *Stenogyra achatinacea* Pfr. in the synonymy of his *achates*, without explanation of so irregular a course.

I have figured a Nicobar shell which seems to me referable to Mörch's form. It is rather obese below, subregularly tapering to the obtuse, smooth apex, sculptured with narrow, spaced, thread-like riblets which curve forwards above the periphery and are much weaker below it. Whorls slightly more than 7, moderately convex. The aperture is long, the outer lip arched forward above, and the columella reflexed narrowly, leaving a narrow umbilical fissure. Length 13.3, diam. 4.5, length of aperture 5.5 mm.

This form seems to differ from *P. achatinaceum* by its larger aperture.

22. P. HAUGHTONI (Benson). Pl. 6, figs. 76, 78, 79.

Shell imperforate, oblong-conic, subturrited, solid, striate, costulate-striate towards the apex and suture. Whitish, covered with a very finely corrugated olivaceous cuticle. Spire long-conic, suddenly tapering towards the somewhat obtuse apex; suture impressed. Whorls 7, a trifle convex, rather flattened, the last whorl subangulate towards the periphery. Aperture slightly oblique, ovate-elliptical, blue-whitish inside, the right margin thin, acute, columellar margin callous, flat, a little expanded, slightly emarginate towards the base, the margins joined by a thin, expanded, parietal callus. Length 20-30, diam. 10-11, aperture 11 mm. long, 5 wide (*Bens.*).

Andaman Is.: Port Blair (Dr. Walker; Maj. Haughton).

Spiraxis haughtoni BENS., Ann. Mag. Nat. Hist. (3d ser.), xi, p. 90, with var. *oxynter* Bens. (Feb., 1863).—PFR., Monogr., vi, p. 189.—HANLEY & THEOB., Conch. Ind., pl. 19, f. 1; pl. 79, f. 5 (var.).

Two typical examples of this species before me measure: length 27, diam. 10.7, length of aperture 10.5 mm., and 28, 11, 10.7 mm., both having a trifle over 7 whorls. They are solid, strong shells, nearly denuded of the thin, olivaceous-yellow cuticle. The columella is distinctly sigmoid, and the parietal callus arising from it is wholly appressed at the edge, not raised seam-like as in *P. pealei.*

22*a*. Var. *oxynter* Benson. Pl. 6, figs. 77, 82, 83, 84.

"Shell long-turrited, more slender. Length 30, diam. 8 mm.

There is a tendency in the stouter form to verge towards the variety which I have called *oxynter*, though the extreme specimens might be considered as separate species'' (*Bens.*).

I have assumed that the second figure published by Hanley and Theobald, under the title *Spiraxis haughtoni* var. Bens., pertains to the var. *oxynter*, though it measures a little larger than Benson's dimensions, possibly being slightly enlarged by the artist. Two specimens referable to this form are figured, pl. 6, figs. 82, 83, 84. The cuticle is dark olive. They differ from *P. pealei* chiefly in the shape and direction of the columellar margin, which is less sinuous than in *P. haughtoni*. Length 34, diam. 10, length of aperture 10 mm., whorls 8½.

23. P. PEALEI (Tryon). Pl. 6, figs. 80, 81.

Shell imperforate, solid, turrited, white under a thin greenish-yellow cuticle, with a few narrow darker streaks; the apical whorls worn. Spire with straight lateral outlines. Whorls 8¾, slightly convex. Aperture long-ovate, oblique, bluish-white inside; outer lip straightened above, thin and acute. Columella slightly arcuate, passing without angle into the parietal margin, not excised or sinuous at the base. Parietal callus brownish, with distinct outer edge. Length 36.3, diam. 10, length of aperture 11.3 mm.

Andaman Islands.

Opeas (*Bulimus*) *pealei* TRYON, American Journ. of Conch., v, p. 110, pl. 10, f. 5 (Oct. 7, 1869).

The type specimen is described above and figured. It has been referred to *P. haughtoni* Bens. as a synonym, but it differs from that by the non-sinuous columella, which does not form an angle with the parietal wall, by the narrower mouth, more numerous whorls and slenderer shape. The var. *oxynter* of Benson, while nearly as slender as *pealei*, differs by having the columella at an angle with the parietal wall.

24. P. WALKERI (Benson). Pl. 6, fig. 70.

Shell imperforate, cylindric-turrited, arcuately very strongly striated, whitish under the cuticle. Spire slender, the apex obtuse, suture rather deep. Whorls 9, a little convex. Aper-

ture oblique, elliptical; the right margin thin, acute, arcuate above; columellar margin callous, suddenly revolute. Length 14, diam. 3.5 mm. (*Bens.*).

Port Blair, Andaman Is. (Major Haughton). Shan States, Burmah (Fedden). Lampun, Siam (Daly).

Spiraxis walkeri Bens., Ann. and Mag. N. H. (3 ser.), xi, p. 90 (Feb., 1863).—Pfr., Monogr., vi, p. 189.—Hanley & Theobald, Conch. Indica, pl. 79, f. 4.—*Opeas walkeri* (Bens.). Theobald, Journ. Asiat. Soc. Bengal, xxxix, pt. 2, 1870, p. 395 (Shan States).—Blanford, Proc. Malac. Soc. Lond., v, p. 280 (Siam).

25. P. turricula (v. Martens). Pl. 3, figs. 95, 96.

Shell rimate, subulate, closely and finely striate, the striæ arching forward; with a silky luster, waxen. Apex obtuse, subglobose. Whorls 8, the suture deep, the upper ones convex, penultimate and last whorls more flattened, the last noticeably tapering downwards. Aperture subvertical, piriform-oblong, the columellar margin nearly straight, a little dilated, at the base attenuate, not truncate, narrowly reflexed at the insertion. Length 15, diam. 4, length of aperture 5, width 2 mm. (*Martens*).

Siam (Mouhot), purchased in London in 1859-60 for the Berlin Museum.

Stenogyra turricula Martens, P. Z. S. Lond., 1860, p. 9.—*Achatina t.*, Pfr., Monogr., vi, p. 236.—Morelet, Sér. Conch., iv, p. 267, pl. 12, f. 3.—*Stenogyra turricula* Martens, Ostas. Zoöl., Landschn., p. 82, pl. 22, f. 7.—*Bulimus t.*, Pfr., Monogr., vi, p. 98.—*Opeas t.*, Fischer & Dautz., Mission Pavie Indo-Chine, iii, p. 411 (Muok Lek, Siam).

"This species stands quite near *S. achatinacea* Pfr., but on comparison of original examples of both it is seen to differ by the slimmer, less conic shape and finer striation. The upper whorls in both are conspicuously more convex, the penult. and last are swollen only under the suture, then the slope becomes more rectilinear" (*Martens*).

Prof. von Martens' first description (P. Z. S., 1860) was based upon a larger specimen, length 18, diam. 6 mm., aper-

ture 5 mm., in which the columella was stated to be strongly obliquely truncate. Morelet explains the discrepancy between this statement and that in his second description (in the Ostasiatische Landschnecken) by supposing that the shells described differed in age, but really belong to one and the same species. I am wholly inclined to believe that the differences are due partly to age, partly to different ways of describing the tapering base of the columella.

Some authors have referred this species to *P. walkeri* Bens.

26. P. TEREBRALE Theobald.

Shell lengthened, imperforate, thin, corneous, not polished. Whorls 10½, depressed-convex, joined by an impressed suture, closely striate, the last whorl scarcely a third the total length; epidermis scabrous. Peristome acute, the columellar margin very narrowly reflexed, slightly twisted. Length .95, diam. .17, alt. aperture .22 inch (*Theob.*).

Shan States (Fedden).

Stenogyra (*Opeas*) *terebralis* THEOB., Journ. Asiat. Soc. Bengal, vol. 39, 1870, pt. 2, p. 401.—*Bulimus t.*, PFR., Monogr., viii, p. 133.—HANLEY & THEOBALD, Conch. Indica, p. xi.

27. P. TCHEHELENSE (de Morgan). Pl. 4, figs. 7, 8, 9, 10.

Shell imperforate, turrited, pale yellowish-brown (or with a greenish tint where the soft parts show through), lusterless. Whorls 8½, convex, the first 1½ smooth, whitish, the next two sculptured with strong, rather widely and unevenly spaced, arcuate, thread-like striæ; subsequent whorls very densely and finely striate, the striæ arcuate. Last whorl strongly tapering below the periphery. Aperture narrowly ovate, the outer lip arched forward above the periphery, retracted at its sutural insertion. Columella sinuous, concave above, retracted at the base.

Length 16, diam. 4.5 mm., aperture 5 mm. (specimen).

Length 23, diam. 5 mm., aperture 6 mm. (de Morg.).

Malay Peninsula: Gunong Tchehel, in the Pluss valley, 300 meters elevation (de Morgan); Gunong Inas, 3,000 ft. (Skeat exped.); Perak, Belimbing, Ligeh, Biserat, Jalor (Skeat exped.).

Stenogyra tchehelensis DE MORGAN, Le Naturaliste, May, 1885, p. 69; Bull. Soc. Zoöl. France, x, p. 388, pl. 6, f. 7.—*Prosopeas t.*, MLLDFF., Proc. Zoöl. Soc. Lond., 1891, p. 337.—COLLINGE, Journ. of Malac., ix, p. 83.—*Stenogyra* (*Opeas*) *terebralis* NEVILL, Hand-list Ind. Mus., 1878, p. 166.

The disparity in sculpture between the earlier and later whorls is characteristic. The apical whorls (fig. 8) are not costulate. The above description is from a specimen received from M. de Morgan. Dr. von Moellendorff considers *S. swettenhami* synonymous.

Mr. Collinge states that the eggs are exceedingly large for the size of the animal, and are enclosed in a hard, calcareous shell. Specimens having 8 whorls were found to be sexually mature. The largest shell met with was one with 12 whorls.

28. P. SWETTENHAMI (de Morgan). Pl. 4, figs. 11, 12.

Shell subulate, elongate, brown, corneous, obtuse at the summit, composed of 12 or 13 whorls which are very regularly convoluted and ornamented with fine striæ along the growth-lines; suture linear and well marked, covering a very obtuse carina on the preceding whorl. Aperture oval, oblique; peristome straight and acute, the columellar margin reflexed. Length 29, diam. 5, length of aperture 6, width 3 mm. Eggs spherical, calcareous, .5 mm. in diameter (*de Morg.*).

Perak: Mt. Tchora, near Ipoh, in crevices of the rocks (de Morgan).

Stenogyra swettenhami DE MORG., Bull. Soc. Zoöl. France, x, 1885, p. 389, pl. 6, f. 6.

"This species is distinguished from *S. tchehelensis* by its cylindric shape and by having a carina on the lower part of the whorls of the spire."

29. P. HEBES (Blanford). Pl. 12, fig. 6.

Shell imperforate, turrited, corneous, rugose-striate. Spire subulate, the apex very obtuse, suture whitish-edged. Whorls 7, but little convex, the last about one-third the length, rounded basally. Columella a little calloused, a trifle twisted, short. Aperture nearly vertical, long-oval; peristome simple,

straight, the right margin arcuate above. Length 15, diam. 4, aperture 4.5x2 mm. (*Blanf.*).

Nilgiri Mts.

Spiraxis hebes W. & H. Blanf., Contrib. to Indian Malac., no. 2, 1861, p. 15, pl. 1, f. 15, in Journ. Asiatic Soc. Bengal, xxx, 1861, p. 361.—Pfr., Monogr., vi, p. 190.—Hanl. & Theob., Conch. Indica, pl. 79, f. 10.

The above are the dimensions of the largest specimen found. It may be easily distinguished from *S. gracilis*, the only related Indian species, by its very obtuse apex, less numerous whorls, etc.

30. P. anceyi Pilsbry, n. n. Pl. 6, figs. 72, 73.

Shell fragile, subpellucid, glossy, subulate, very narrowly and almost vertically subrimate; under a lens, sculptured with close and arcuate growth-striæ. Spire long, gradually tapering, the apex obtuse, quite large and smooth. Whorls 10, plano-convex, rather rapidly increasing, separated by an impressed, very minutely and regularly crenulated suture. Last whorl cylindric-oblong, tapering basally, hardly ascending. Aperture vertical, oblong, narrowed above and below, the base receding. Columella slightly arcuate, a little thickened, reaching to the base of the aperture, scarcely truncated. Columellar margin lengthened and narrowly dilated above the rimation. Lip acute, rounded and produced in front. Color pale grayish-corneous. Length 15.25, diam. 3.25, aperture 4x2 mm. (*Ancey*).

Bac-Kan, Tonquin (Messager).

Prosopeas macilentum Ancey, Journ. de Conchyl., 1903, p. 220, pl. 9, f. 23, 24. Not of Reeve.

This species is especially remarkable for its subulate, greatly lengthened form. The name proposed by Mr. Ancey is preoccupied for a Philippine species.

31. P. henrici (Ancey). Pl. 4, figs. 14, 15.

Shell very long, produced-turrited, thin, pale corneous, with a somewhat oily gleam, scarcely perforate; provided with flexuous growth-striæ which are arched forward below

the suture. Spire slender, regularly tapering to the obtuse apex. Whorls 11½, slowly increasing, the first convex, the rest plano-convex; suture well impressed, suboblique; last whorl oblong, slightly wider than the preceding, rounded anteriorly to the middle, tapering below. Aperture subvertical, oblong, angular above, anteriorly produced arcuately near the insertion, the base receding, somewhat narrowed. Columella hardly truncate but arcuate, and at the base subplicate within. Peristome simple, giving off a small lamina over the very minute perforation. Length 27.5, diam. 5.75, aperture 6 mm. (*Anc.*).

Laos: Luang-prabang (Henri Counillon).

Stenogyra henrici Anc., Annales du Musée d'Histoire Naturelle de Marseille (ser. ii), i, p. 134, pl. 9, f. E (Sept., 1894).

This handsome Stenogyra of the group *Prosopeas* seems to me to have affinities with *S. pagoda* Semper, of Luzon, and not with other forms now known from Indo-China (*Ancey*).

32. P. teres (H. Adams). Pl. 4, fig. 13.

Shell turrited, rather thin, obliquely minutely striate, pale fulvous. Spire lengthened, the apex obtuse, suture somewhat channelled. Whorls 9, a little convex, the last tapering basally, slightly more than one-third the length. Columella arcuate, not reaching the base of the aperture, subtruncate. Aperture suboval, peristome simple, unexpanded, the right margin sinuous. Length 25, diam. 6 mm.; aperture 7x3.5 mm. (*H. Ad.*).

Hainan (Mr. Swinhoe).

Rumina (*Subulina*) *teres* H. Ad., P. Z. S., 1870, p. 8, pl. 1, f. 14.—*Achatina t.*, Pfr., Monogr., viii, p. 288.

33. P. decorticatum (Reeve). Pl. 6, fig. 74.

"Shell subulate, rather solid, scarcely umbilicate, whorls eight in number, concentrically rather rudely plicately striated, columella thin, reflected, aperture rather small, oblong-ovate, lip thin; dull greenish horn" (*Reeve*).

Length 10.3 mm.

Macao, China (Dr. Cantor, in Benson coll.).

Bulimus decorticatus Rve., Conch. Icon., v, pl. 80, f. 592, (Dec., 1849).—Pfr., Monogr., iii, p. 402.—*Stenogyra d.*, Marts., Ostas. Zoöl., p. 53.

"A shell of rather solid growth, longitudinally sculptured throughout with rude, plicate striæ" (*Rve.*).

Von Martens considers this to be identical with *B. fortunei* Pfr., which is described thus:

B. fortunei Pfr. (pl. 12, fig. 10). Shell slightly subperforate, turrited, rather solid, longitudinally closely costulate-striate, scarcely shining, subdiaphanous, waxen. Spire regularly turrited, the apex obtuse. Whorls 7½, a little convex, the last about one-third the total length, rounded at the base. Columella lightly arcuate. Aperture oblique, oval, rounded basally; peristome simple, unexpanded, the right margin spreading, columellar margin narrowly reflexed. Length 11, diam. 4, alt. aperture scarcely 4 mm., width 2 mm. (*Pfr.*).

Shanghai, China (Fortune).

Bulimus fortunei Pfr., P. Z. S., 1852, p. 137; Monogr., iii, p. 398; Conchyl. Cab., p. 255, pl. 69, f. 6-8.—*Stenogyra f.*, Martens, Ostas. Zoöl., p. 53.

According to von Martens, this species is very closely related to *O. panayensis*. Gredler (Malak. Bl. n. F., ix, p. 142) places *decorticata* Reeve and *scalaris* Desh. in the synonymy of *Opeas subula*, which he records from southern Shensi, Peking and middle China, abundant.

34. P. striatissimum (Gredler).

Shell nearly covered rimate, subulate, *deeply and closely striate*, the striæ about straight, slightly arched forward; waxen, *opaque*, lusterless; apex somewhat obtuse. Whorls 7, convex except the last two which are less so; last whorl one-third the total length, convex below; suture rather deep. Aperture subvertical, narrow, elliptical-piriform. Columella subarcuate, not truncate, nearly forming an angle at its junction with the outer margin; columellar margin a little dilated, noticeably tapering downwards, slightly reflexed above. Length 9, diam. 3 mm. (*Gredl.*).

China: province Shan-tung; at Tsi-nan-fu (Gredler).

Stenogyra striatissima Gredler, Jahrb. D. Malak. Ges., ix, p. 49, 1882.—*Opeas striatissa* Gredl., Malak. Bl. (n. F.), ix, p. 142 (1887).

Of the shape and size of *S. fortunei* Pfr., but closely and deeply striate, the whorls less numerous, with the exception of the last two, more convex, etc. The intervals are not wider than the striæ. The generic position is uncertain. In his later list, Gredler writes the name "*striatissa* Gredl. (nicht '*striatissima*')."

Genus PERRIERIA Tapparone Canefri.

See Man. Conch., vol. xvi, p. 189.

At the time my monograph of this genus was prepared the internal structure of the shell of *Perrieria* was unknown, and no specimens were accessible to me. Mr. E. R. Sykes has recently shown that there are no internal lamellæ or plicæ, and the slender axis is strongly sinuous. He suggests that the genus may belong to the *Achatinidæ*. This change of family position seems to be justified by our present knowledge; and pending an examination of the soft anatomy, I would place *Perrieria* in the vicinity of *Prosopeas* or *Tortaxis*, the external sculpture most resembling the former, the columella the latter genus. *Cœlocion*, which I have examined, is certainly very unlike *Perrieria* in internal structure. It is surely not Achatinoid, and should remain, I believe, in the *Megaspiridæ*.

P. canefriana Sykes. Pl. 4, figs. 16, 17.

"Shell sinistral, spire elongate and gradually tapering towards the apex, truncate, uniform dark chestnut-brown in color, somewhat polished; sculpture well marked lines of growth; whorls remaining 7, plano-convex, regularly increasing to the last whorl, very little, if at all, ascending in front; aperture somewhat piriform, dusky brown within, peristome whitish, continuous, somewhat thickened, the outer margin a little expanded, and the columella rather twisted and truncate. Alt. 24.5, diam. max. 6.4; alt. apert. 7.3, diam. apert. 5 mm." (*Sykes*).

Island of Obi.

Perrieria canefriana SYKES, Journ. of Malac., 1904, xi, p. 91, pl. 9, f. 3, 4.

"This interesting discovery extends the range of the genus, hitherto known only from New Guinea. The present species is by far the smallest of the three described and may be separated from *P. minor* Smith by its darker color, more tapering form, and by the columella being more twisted. As Mr. Pilsbry states (Man. Conch., ser. 2, vol. xvi, p. 189) 'the internal structure of the shell has not been investigated,' I have broken up a specimen, which is now figured. The axis is much twisted, and I am unable to trace any armature upon it. I doubt if *Perrieria* belongs to the *Megaspiridæ*; may it not be really referable to the *Achatinidæ*?" (*Sykes*).

Genus HYPOLYSIA Melvill & Ponsonby.

Ann. and Mag. N. H. (7), viii, p. 318 (Oct., 1901).

"Shell slender, fusiform, tapering, as in Subulina, but thickened throughout close to the suture." Aperture ovate as in *Opeas*, the outer lip projecting as a rounded lobe far forward, deeply retracted to the suture. Columellar margin reflexed above. Type *H. florentiæ* (pl. 10, f. 66, 67).

Distribution, Natal. From the figure the axis seems to be perforate or rimate, but nothing is said about it in the text. The columella is said to be truncate at base, but the truncation must be inconspicuous and oblique, since it is scarcely indicated in the figures. The group is apparently near *Opeas*, but distinct by the forwardly projecting lip, excised at the suture. This is an exaggerated form of the structure seen in *Curvella*, and weakly shown in *Opeas* itself.

H. FLORENTIÆ Melvill & Ponsonby. Pl. 10, figs. 66, 67.

Shell elegantly tapering, thin, delicate, crystalline white. Whorls 9 to 10, of which the apical two are mamillate, obtuse, the rest thickened near the suture, tumid, under a lens longitudinally oblique-striate; last whorl exceeding in length the preceding four. Aperture small, oblong; peristome thin, evolute above; columella straight, truncate towards the base. Length 11.5, diam. 2.5 mm. (*M. & P.*).

Natal: Durban (Burnup).

Hypolysia florentiæ M. & P., Am. Mag. N. H. (7), viii, 1901, p. 318, pl. 2, f. 8; (7) xii, p. 596, pl. 32, f. 13.

The figure shows no trace of columellar truncation, at least in a front view.

Genus EUONYMA Melvill & Ponsonby.

Euonyma M. & P., Annals and Magazine of Natural History, 6th ser., xviii, p. 316 (Oct., 1896), for *Subulina læocochlis.*

Rather large, slender Stenogyroid snails with the apex rounded, hemispherical and smooth, not deciduous; whorls numerous, striate or smooth; texture as in *Opeas*, or more solid. Aperture ovate, columellar lip reflexed, adnate or leaving an umbilical crevice, the columella concave or straight, not truncate, continuous with the basal lip; outer lip simple. Eggs globular, as in *Opeas, Subulina*, etc. Type *E. læocochlis.*

Distribution, South Africa; one species from as far north as Ussambara. Illustrated on plate 10.

This genus was proposed, without definition, for a single sinistral species, which in all other characters agrees with a somewhat numerous group of South African snails which have been referred by Melvill and Ponsonby to *Subulina*, and by Sturany more correctly to *Opeas.* From the latter group they differ chiefly by the larger size and general aspect, which is quite that of the typical American *Stenogyra*, a group practically identical with *Euonyma* conchologically. *Euonyma* is kept separate from *Stenogyra* solely by the diverse distribution, *Stenogyra* in the restricted sense comprising only tropical American species.

As an abstract proposition, I do not favor the separation of genera purely upon the ground of diverse geographic distribution. But the South African fauna is so totally unlike the tropical American that it seems likely when a careful comparison of the whole structure can be made, that some differences of generic value will be found between *Euonyma* and *Stenogyra.*

Aside from *Stenogyra*, the affinities of *Euonyma* seem to be with *Opeas, Tortaxis* and *Prosopeas.*

No species referable to *Subulina* has been reported from South Africa. Several species of *Opeas* have been described.

1. E. LÆOCOCHLIS (Melvill & Ponsonby). Pl. 10, fig. 68.

"Shell sinistral, fusiform, the upper whorls somewhat attenuate; whorls thirteen in number, mostly very narrow, broadening distinctly towards the base. The specimens (two) before us being dead, we cannot tell the color, but probably it is pale olivaceous. The whorls are nearly smooth, but are obscurely longitudinally obliquely striate, the basal whorl slightly angled in front; aperture oblong, the columellar margin being straightly produced and slightly reflexed" (*Melv. & Pons.*).

Length $1\frac{3}{16}$, width $\frac{5}{16}$ inch.

Humansdorp, St. Francis Bay.

Subulina læocochlis M. & P., Ann. and Mag. N. H. (6), xviii, p. 316, pl. 16, f. 3 (Oct., 1896).

2. E. LYMNEÆFORMIS (Melvill & Ponsonby). Pl. 10, fig. 69.

Shell conspicuous, olivaceous straw-colored, tapering-fusiform, cylindric, thin, glossy. Whorls 10 to 11, of which the upper three are dull white, but little shining, the apex itself being obtuse, more or less worn in our specimens; remaining whorls a little impressed at the sutures, slightly swollen, delicately and irregularly striate under the lens; last whorl about equal to the preceding three, narrow, prolonged. Aperture ovate-lunar; peristome thin, a little contracted above, slightly effuse basally, the columellar margin a little thickened, uniplicate.

Length 39, diam. 8.25 mm.

Length 34, diam. 7.5 mm. (*M. & P.*).

Natal: Karkloop Bush (J. McBean).

Obeliscus lymneæformis M. & P., Ann. and Mag. N. H. (7), viii, p. 317, pl. 2, f. 5 (Oct., 1901).

"A fine species, with no near ally in its fauna. The two examples before us vary slightly *inter se*, the larger being

basally more attenuate and not possessing the slight labial effusion of its fellow, while the substance is more pellucid and the color clear straw. Both are more or less apically detrite" (*Melv. & Pons.*).

3. E. LANCEOLATA (Pfeiffer).

Shell imperforate, turrited, rather solid, longitudinally subarcuate-striate, diaphanous, whitish straw-colored; spire lengthened, rather acute; suture light, crenulate. Whorls 13, nearly flat, the last forming two-sevenths the total length, slightly tapering basally. Columella somewhat twisted above, then straightened. Aperture little oblique, acuminate-oval, subangulate basally; peristome simple, straight, the columellar margin very narrowly reflexed. Length 52, diam. 14, aperture 15x7 mm. (*Pfr.*).

Cape Natal (Plant, in Cuming coll.). Durban (Dr. Penther).

Bulimus lanceolatus PFR., P. Z. S., 1854, p. 292; Monogr., iv, p. 455.—*Obeliscus l.*, MELV. & PONS., Proc. Malac. Soc. Lond., iii, p. 179.—*Bulimus micans* PFR., Malak. Bl., iv, 1857, p. 156; Monogr., iv, p. 452.—*Stenogyra* (*Obeliscus*) *l.*, STURANY, Denkschr. K. Akad. Wissensch., lxvii, 1899, p. 595.

Melvill and Ponsonby include *Bulimus micans* Pfr. as a synonym of *lanceolata.* The original description follows: *Bulimus micans.* Shell imperforate, turrited, rather thin, closely plicate-striate and obsoletely a little decussate, silky, tawny-waxen. Spire regularly tapering, the apex rather obtuse, suture subcrenate. Whorls 10 to 11, flattened, the last not a third the total length, subangular in the middle. Columella vertical. Aperture oblique, elliptical-oblong, peristome simple, the right margin straight; columellar margin shortly reflexed, adnate, its junction with the basal margin subangular. Length 36, diam. 9, aperture 11x4.5 mm. In the region of Natal (*Pfr.*).

This form, like *lanceolata*, was described from specimens collected by Plant, and in the Cuming collection.

4. E. ACUS (Morelet). Pl. 10, fig. 70.

Shell covered-rimate, rather solid, turrited, irregularly stri-

atulate, slightly shining, pale tawny. Spire long, the apex subacute. Whorls 13 to 14, planulate, joined by a simple suture, the last whorl one-fourth the total length. Aperture small, acutely oval; outer margin of the peristome simple, straight; columellar margin dilated, reflexed. Length 28, diam. 6 mm. (*Morel.*).

Natal, near Port Elizabeth (Crawford).

Stenogyra acus MOREL., Journ. de Conchyl., 1889, p. 8, pl. 1, fig. 6. Not *Bulimus acus* Pfr., a *Cœlostele*.

This shell belongs to the group of *B. lanceolatus* Pfr. which inhabits the same region. It reproduces that species in miniature, having a shell of the same sort, epidermis the same color, and an equal number of whorls; but it is smaller and more delicate, the last whorl is less developed, the aperture smaller, and finally, the left border of the peristome is more widely dilated and leaves an umbilical crevice, which does not exist in its congener *B. lanceolatus* (*Morelet*).

5. E. NATALENSIS (Burnup). Pl. 10, fig. 72.

"Shell elongate, attenuate above, very narrowly umbilicate, thin, yellowish-white, shining, subtranslucent; with 9½ rather ventricose whorls, the last being one-third of the whole length of the shell, and all, except the first two apical whorls, being ornamented with close, fine, sharp, curved, transverse liræ, the apical whorls being smooth, and the apex itself obtuse; aperture ovate; outer lip very thin, simple, arched forward rather above the middle, and receding towards the base; inner lip rolled closely back over the columella, which is arcuate. Length 21.5, lat. 6.75 mm." (*Burnup*).

Umbogintwini, near Durban, Natal (Burnup).

Obeliscus natalensis BURNUP, Proc. Malac. Soc. Lond., vi, p. 304, pl. 16, f. 9 (June, 1905).

The close lirate sculpture, which gives the whole shell a soft, silky appearance, readily distinguishes this species from *O. lanceolatus* (Pfr.), which is the nearest South African ally known. In the type the exceedingly thin labrum is slightly broken away at the base, for which due allowance has been made in the measurements given. On the parietal wall the

sculpture is almost obliterated by the beginning of the formation of a callus. A second example of this shell, found at Table Mountain (Natal), at a distance of about 50 miles from Umbogintwini, and at an altitude of fully 2,000 feet above the sea (while the last named locality is little above sea-level), has the callus, which is almost pure white, in a more advanced state of development, and the labrum more triangularly reflexed, and is 23 mm. long by 7 mm. broad. It also has the thin labrum slightly damaged (*Burnup*).

6. E. CACUMINATA (Melvill & Ponsonby). Pl. 10, figs. 71, 73, 74.

Shell acutely turrited, slender, pellucid, whitish-corneous, very smooth throughout, glossy. Whorls 10, the last five nearly equal, gradually gradate towards the apex; apex somewhat papillar. Aperture ovate; peristome simple, acute. Length 21, diam. 5 mm. (*M. & P.*).

South Africa: Bedford (Farquhar).

Stenogyra cacuminata M. & P., Ann. and Mag. N. H. (6), ix, p. 85, pl. 6, f. 2 (Jan., 1892).—*Subulina c.*, M. & P., Proc. Malac. Soc. Lond., iii, p. 179.

"A remarkably delicate, shining, pellucid shell, differing from all the species of the genus hitherto described, though its characters are simple enough" (*M. & P.*).

Two specimens are before me, the larger being figured, pl. 10, figs. 73, 74. The shell tapers almost straightly, but is just perceptibly contracted near the obtuse, rounded summit. It is very glossy, pale greenish-yellow, corneous, and shows only very weak wrinkles of growth. The upper whorl is smooth, hemispherical; the third whorl is 2 mm. in diam. The whorls increase very slowly, and the last is short. Aperture oblique, ovate, the columella concave, its edge reflexed and adnate. Length 32.7, diam. 7.8, length of aperture 6.5 mm.; whorls 12.

7. E. PURCELLI (Melvill & Ponsonby). Pl. 10, fig. 75.

Shell fusiform, tapering above, thin, a little shining, rather smooth, pale olive-greenish. Whorls 9, the first two mamil-

late, very obtuse, the rest swollen; last whorl short. Aperture ovate; peristome thin, a little effuse, the columellar margin a little thickened, white, somewhat truncate towards the base. Length 17, diam. 4.5 mm. (*M. & P.*).

Cape Colony: Caledon (Mr. Purcell).

Subulina purcelli M. & P., Ann. and Mag. N. H. (7), viii, p. 317; pl. 2, f. 6 (Oct., 1901).

"A *Subulina* of unusual form, perhaps not quite adult. The tumid whorls, extremely obtuse apex, want of sculpture, peculiar olive-green hue, and somewhat compressed body-whorl amply characterize it" (*M. & P.*).

8. E. GLAUCOCYANEA (Melvill & Ponsonby). Pl. 10, fig. 76.

Shell fusiform, corneous, bluish, a little glossy. Whorls 10 to 11, a little flattened, obscurely striate, the striæ nearly straight. Aperture ovate-oblong; peristome outwardly thin, the columellar margin reflexed, straight. Length 22, diam. 5 mm. (*M. & P.*).

Port Elizabeth.

Subulina glaucocyanea M. & P., Ann. and Mag. (6), xviii, p. 317, pl. 16, f. 5 (Oct., 1896).

"Allied, doubtless, closely to *S. turriformis* Krauss, the commonest and best known South African species, but differing in the following particulars: (*a*) greater size; (*b*) texture, being more transparently corneous; (*c*) color, a livid glaucous blue; and (*d*) lastly, in the whorls being less impressed at the sutures" (*M. & P.*).

9. E. TURRIFORMIS (Krauss). Pl. 10, fig. 77, 78.

Shell subrimate, long-turrited, thin, glossy corneous, nearly smooth. Spire long, rather acute. Whorls 9, a little convex, the last one-third the total length. Columella straightened. Aperture oblong-oval; peristome simple, acute, unexpanded, the columellar margin shortly reflexed, basal margin appressed. Length 7.5, diam. 2.2 lines (*Krauss*).

Natal (J. A. Wahlberg); Port Elizabeth; Lydenburg, Transvaal (Craven); The Kowie (Dr. Penther).

Bulimus turriformis KRAUSS, Die Sudafrikanischen Mol-

lusken, p. 78, pl. 5, f. 2 (1848).—Pfr., Monogr., iii, p. 392.—Morelet, J. de Conchyl., 1889, p. 19.—*Bulimus* (*Stenogyra*) *turriformis* Craven, P. Z. S., 1880, p. 615.—*Opeas turriforme* Kr., Sturany, Denkschr. K. Akad. Wiss. Wien, lxvii, 1899, p. 596. Not *Bulimus turriformis* Reeve, 1850.

Specimens before me from Pinetown are about typical in size and form, length 14.5, diam. 4.4 mm., aperture 5 mm. long, are of a greenish-corneous tint, rather opaque. The fine striæ are arcuate and stronger near the suture, almost obsolete on the base; whorls 8½, the first smooth, hemispherical. The early whorls are just perceptibly attenuate. Suture deeply impressed. The apex is small; the diam. of the third whorl 1 mm. Some eggs of these specimens are globular, 1.2 mm. in diam.

E. turriformis sarissa n. subsp. Pl. 10, figs. 84, 85.

Shell perforate (more openly than in *turriformis*), acuminate-turrited, the upper fourth perceptibly contracted, the apex small, obtuse; bluish-corneous under a very thin pale yellowish cuticle, subtranslucent, the columellar axis faintly visible through; thin, glossy. Sculpture of fine, irregular wrinkles of growth, arcuate and strongest near the suture. Whorls 10, moderately convex, separated by an impressed suture, faintly margined by translucence below. Aperture long-ovate, the outer lip arched forward above, somewhat retracted basally. Columella nearly straight with triangularly reflexed edge. Length 20.7, diam. 6, length of aperture 7 mm.; diam. of apex 1 mm.

Natal.

This form is represented by a dozen specimens presented to the Academy by John Cassin many years ago. It is in every way larger than *turriformis*, more transparent, with more whorls and a narrower aperture, but in other respects it agrees closely.

10. E. linearis (Krauss). Pl. 10, figs. 79, 80.

Shell subrimate, turrited-subulate, thin, somewhat glossy, corneous, very finely striate. Spire elongate, the apex rather

acute. Whorls 10, rather flat, the last one-fourth the total length. Columella straightened. Aperture oval; peristome simple, acute, the right margin arcuate, columellar margin shortly reflexed, basal appressed. Length 5.8, diam. 1.3 lines (*Krauss*).

Port Elizabeth; Durban Bluff, Isipingo, etc. (Dr. Penther); Mt. Mohapaani, on the Limpopo river (J. A. Wahlberg, type loc.), Wynberg, Orange River Colony, and Lydenburg, Transvaal (Craven).

Bulimus linearis KRAUSS, Die Sudafr. Moll., p. 78, pl. 5, f. 3 (1848).—PFR., Monogr., ii, p. 157; Conchyl. Cab., p. 257, pl. 69, f. 15-17.—REEVE, C. Icon., v, fig. 648.—CRAVEN, P. Z. S., 1880, p. 616.—MORELET, J. de Conch., 1889, p. 19.—*Opeas lineare* STURANY, Denkschr. K. Akad. Wiss. Wien, lxvii, p. 597, 1899.

"*B. turriformis* and *B. linearis* are closely related to one another, but the last is comparatively much longer and narrower, almost cylindric, distinctly striate, has 10 whorls, and the mouth is but little lengthened. The striæ (which are visible only under a lens), as well as the right margin of the peristome, are arcuate" (*Krauss*).

Sturany remarks that this species has a thread-like suture, other characteristic marks being the glossy surface, the number of whorls (10), and the size, about 12.5x3 mm.

11. E. CRYSTALLINA (Melvill & Ponsonby). Pl. 10, fig. 81.

Shell very glassy, very slender and very thin, glossy, wholly smooth. Whorls 11, impressed at the suture, gradually increasing, straight, the last a little produced. Aperture small, ovate; peristome thin and simple. Length 15, diam. 3 mm. (*M. & P.*).

Pietermaritzburg.

Subulina crystallina M. & P., Ann. and Mag. N. H. (6), xviii, p. 316, pl. 16, f. 4 (Oct., 1896).

"A very graceful, glossy species, separable at a glance from its South African congeners."

12. E. MAGILENSIS (Craven). Pl. 10, figs. 82, 83.

"Shell turriform, subtransparent, solid, very glossy, show-

ing the lines of growth very plainly, of a pale olive-brown color, rather lighter near the apex; apex large and obtuse, spire elongated; whorls 9 to 10, very slightly convex and gradually increasing; aperture pyriform, occupying rather less than one-sixth of the entire length of the shell; labrum simple, columella somewhat oblique and faintly reflexed; suture very deep but narrow, slightly puckered at its edges. Length 30 to 35, diam. 9, aperture 7x4.5 mm. (*Craven*).

Magila, Ussambara, under moss growing on rocks (Craven); Zanzibar coast, in woods under stones (Dr. W. Schmidt).

Bulimus magilensis Crav., P. Z. S., 1880, p. 217, pl. 22, f. 3.—*Opeas magilense* Marts., Beschalte Weichthiere D. Ost-Afr., p. 126.

Peculiar by its bright gloss and thick-edged aperture, broadly rounded below; imperforate. Prof. von. Martens gives the measurements of Dr. Schmidt's specimen as length 50, diam. 8, aperture very oblique, 7.5x5.5 mm., whorls 9½.

Genus CURVELLA Chaper, 1885.

Hapalus Albers, Die Heliceen, 1850, p. 140, for *Bulimus grateloupi* Pfr. Not *Hapalus* Billberg, Enum. Ins., p. 37, 1820 (Coleoptera).—*Curvella* Chaper, Bull. Soc. Zoöl. de France, x, pp. 48, 49 (1885), for *C. sulcata* and *C. inornata*.

Shell oblong-conic, perforate or imperforate, thin, translucent, covered with a thin, pale cuticle (as in *Opeas*); growth-lines strongly arcuate. Apical whorl obtuse, rounded and smooth. Aperture ovate, the outer lip acute, *arching forward in the middle, retracted at suture* and base; columella slightly sinuous or straight, curving into the basal margin. Central tooth of the radula narrow, laterals tricuspid. Type *C. sulcata* Chaper.

Distribution, Africa, India, East Indies. Illustrated on plates 6 to 9.

This genus is separated from *Opeas* by the forwardly arched outer lip, the shorter, wider contour, and usually smaller number of whorls. The columella is frequently sinuous. In some cases the separation from *Opeas* seems some-

what arbitrary, and the boundaries of the two groups in detail are still unsettled.

The species were considered Bulimi in the older classifications, but there is no doubt that they are Achatinoid.

Reproduction is by globular eggs, small and calcareous-shelled, as in the closely related group *Opeas*.

The species may be grouped thus:

African species:

West Africa, species 1 to 10.

East Africa, species 11 to 20.

South Africa, species 21 to 28.

Indian and Chinese species, no. 29 to 37.

East Indian and Philippine species, no. 38 to 45.

Key to West African species of Curvella.

I. Axis perforate.

a. Aperture half the length of shell or more.

b. Length 5.5, diam. 2.5 mm., whorls 6. *C. ovata*, no. 7.

bb. Length 12 mm. *C. guineensis*, no. 9; *C. concentrica*, no. 8.

aa. Aperture decidedly less than half the length. *C. terrulenta*, no. 10; *C. redfieldi* juv., no. 3.

II. Axis imperforate in adult shells:

a. Columella straight or nearly so.

b. Sculpture of growth-striæ; 5 convex whorls; length about 10 mm. *C. inornata*, no. 6.

bb. Sculpture of growth-striæ and spaced grooves; whorls 5½; 9x4, aperture 4.5 mm. *C. liberiana*, no. 5.

aa. Columella decidedly sinuous.

b. Aperture less than half the total length; sculpture of striæ or growth-wrinkles only.

c. Length 11, diam. 4.7, apert. 5 mm.; 6½ whorls. *C. decepta*, no. 4.

cc. Length 10.7-11, diam. 3.5-4, apert. 4-4.3 mm.; 7 whorls. *C. redfieldi*, no. 3.

bb. Aperture half the shell's length; sculpture of arcuate, spaced grooves.

c. 9x4 mm., whorls 5. *C. sulcata*, no. 1.

cc. 8½x3⅓ mm., whorls 7. *C. daillyana*, no. 2.

1. C. SULCATA Chaper. Pl. 7, figs. 1, 2.

The shell is very regularly conic and composed of 5 whorls; thin, transparent, olivaceous, the whorls not globose, and the suture in consequence not very deep. They are ornamented with flat, glossy plaits, very regularly spaced, separated by narrow intervals, and curved like the lip-edge. The columella is a little curved. Length 9, diam. 4 mm.

Coffee plantation of Elima, lagune d'Assinie, on the Ivory Coast (Chaper).

Curvella sulcata CHAPER, Bull. Soc. Zoöl. de France, 1885, p. 48, pl. 1, f. 10, 11.—*C. striata* JOUSSEAUME, Proces-verbaux de la Soc. Zoöl. de France, 1885, p. xxii (error for *sulcata*).

Type is in the collection of the Ecole des Mines. The aperture seems from the figure to be about half the length of the shell.

2. C. DAILLYANA Pilsbry, n. n. Pl. 7, fig. 3.

Shell subfusiformly long-ovate, imperforate, glossy, subperpendicularly arcuately impressed sulcate; spire long-conic with rather obtuse apex. Whorls 7, a little convex; separated by a margined, impressed suture, slightly ascending at the aperture; last whorl tapering basally, about half the length of the shell. Aperture vertical, sinuate-long-ovate; columella strongly twisted; peristome unexpanded, acute, the right margin noticeably arcuate, moderately produced arcuately in the middle; columellar margin widely reflexed above, adnate, callously thickened forming a duplication; below bending strongly to the left, joining the basal margin with a curve. Length 8.5, diam. 3.33 mm. (*d'Ailly*).

Kamerun: Ekumba-Liongo (Duzen); Buea (Jungner).

Hapalus sulcatus D'AILLY, Mollusques terrestres et d'eau douce de Kameroun, in Bihang till K. Sv. Vet.-Akad. Handl.,

xxii, afd. iv, no. 2, p. 60, pl. 5, f. 5, 1896. Not *C. sulcata* Chaper.

This species seems to be very closely related to *C. sulcata* Chaper; but that shell, while larger, is said to have but five whorls. The columella is twisted more than in *C. decepta* Rve.

3. C. REDFIELDI Pilsbry, n. sp. Pl. 7, figs. 6, 7.

Shell imperforate, turrited, slender, the diameter contained 2½ to 3 times in the length, thin, subtranslucent, yellow or corneous-yellow, glossy. Surface sculptured with *fine, irregular growth-wrinkles only, without impressed grooves*, the wrinkles moderately arched forward in the middle, retracted above and below. Whorls 7, moderately convex. Aperture decidedly less than half the length of the shell, irregularly ovate. Outer lip thin, acute, *moderately arched forward;* columella rather thick, sinuous, the reflexed columellar margin completely appressed in adult shells.

Length 10.7, diam. 3.5, aperture 4 mm. (type).

Length 11, diam. 4, aperture 4.3 mm. (widest specimen).

Length 8, diam. 3.3, aperture 3.7 mm. (immature shell with 6 whorls.

Liberia, with *Subulina angustior*, etc. (J. H. Redfield); Cape Palmas (A. N. S. coll.). Types no. 58202 A. N. S. P.

A series of ten specimens is before me, most of them 8 mm. long, with 6 whorls, and having a very small perforation below the columellar reflection, which is appressed except close to the columellar lip. I take this to be a sign of immaturity, although most of the specimens contained eggs. In two specimens of more than 10 mm. length the axis is wholly closed. *C. decepta* is a wider, more conic shell, with the columella more twisted. *C. inornata* differs by its straight columella; while *C. sulcata* and *daillyana* are more strongly sculptured shells with the aperture larger, half the shell's length. The globular, dirty white, calcareous eggs are 1 mm. in diameter.

4. C. DECEPTA (Reeve). Pl. 7, fig. 10, 11.

"Shell somewhat fusiformly conical, whorls seven in num-

ber, smooth, shining, obscurely concentrically striated from the sutures, columella tortuous, receding, callous at the edge, aperture oblong, lip simple; greenish-glassy, transparent" (*Rve.*).

Length 11, diam. 4.5, aperture 5x2.25 mm. (*Pfr.*).

Liberia: Cape Palmas.

Bulimus interstinctus Gld., Pfr., Monogr., ii, 1848, p. 169 (not of Gould).—*Bulimus deceptus* Reeve, Conch. Icon., v, pl. 68, f. 488 (May, 1849).—Pfr., Monogr., iii, p. 435.

It is related to *C. guineensis*, but differs by the shorter last whorl, not tapering base, more twisted columella, etc. It is imperforate, while *guineensis* is described as rimate.

Specimens are before me from Cape Palmas, Liberia, one being figured, pl. 7, fig. 11. The spire is straightly conic, apex obtuse, whorls 6½. The glossy surface is sculptured with close but weak growth-wrinkles, which arch forwards in the middle and are moderately retracted above and below. The columella is thick, cord-like, and strongly twisted, imperforate. Length 11, diam. 4.7, length of aperture 5 mm.

5. C. liberiana Pilsbry, n. sp. Pl. 7, figs. 12, 13.

Shell imperforate, ovate-turrited, thin, glossy, translucent, yellow. Surface sculptured with rather wide-spaced, forwardly-arcuate grooves, which on the last half whorl become much more numerous and closer. Between the grooves there are slight growth-wrinkles. The spire is straightly conic, apex obtuse. Whorls 5½, convex. Aperture narrow, half the length of the shell, the outer lip moderately arched forwards. Columella subvertical, nearly straight, thick, abruptly terminating below, the basal lip being thin and somewhat retracted. Length 9, diam. 4, alt. of aperture 4.5 mm.

Liberia, with *C. redfieldi, Subulina angustior* and *S. striatella*. Type no. 58201 A. N. S. P.

This species seems to be well distinguished by the grooves of the surface and nearly straight columella. *C. inornata* Chaper is described as having a straight columella, but without grooves. In *C. sulcata* and *daillyana* the columella is strongly twisted.

6. C. INORNATA Chaper. *Unfigured.*

Similar in shape to *C. sulcata*, having also 5 whorls, but differing in three constant characters: the whorls are more globose, the sculpture consists of simple growth-striæ usually gathered into groups, very variable in prominence and often inconspicuous; and finally the columella is perfectly straight. The species is also a little larger.

Plantation Elima, Assinie, on the Ivory Coast (Chaper).

Curvella inornata CHAPER, Bull. Soc. Zoöl. France, 1885, p. 49.

7. C. OVATA (Putzeys). Pl. 7, fig. 8.

Shell oblong-turrited, covered umbilicate, thin white, subdiaphanous, the apex obtuse. Whorls 6, ornamented with close, arcuate, longitudinal riblets. Aperture oblong, the lip acute, arched in the middle; columella straight, vertical, the columellar margin reflexed over the perforation. Length 5.5, diam. 2.5, length of aperture 2.5 mm. (*Putz.*).

Congo basin: Nsendwe, Manyema.

Hapalus ovatus PUTZ., Ann. de la Soc. Roy. Malac. de Belgique, xxxiv, 1899, Bulletins, p. lviii.

8. C. CONCENTRICA (Reeve). Pl. 7, figs. 9, 14, 15.

"Shell somewhat acuminately oblong, scarcely umbilicated, whorls seven in number, rather ventricose, concentrically finely striated, columella thinly reflected, aperture rather large, sinuated at the upper part; transparent straw-color" (*Rve.*).

Length 12, diam. 5, aperture 5.5x2.33 mm. (*Pfr.*).

Liberia (Rve., Cuming coll.); Cape Palmas (A. Gould).

Bulimus concentricus RVE., Conch. Icon., v, pl. 88, f. 656 (Feb., 1850).—PFR., Monogr., iii, 437.

Reeve's figure is copied, pl. 7, fig. 9. Numerous specimens from Cape Palmas are before me, one being drawn in figs. 14, 15. They have a straightly conic spire of 6½ to 7 convex whorls, the later ones densely sculptured with fine, unequal, strongly arcuate striæ. There is a small umbilical perforation below the reflexed columellar lip. Two shells measure:

Length 12.8, diam. 5.5, aperture 5.8 mm.
Length 11.2, diam. 5, aperture 5.5 mm.

9. C. GUINEENSIS ('Jonas' Phil.). Pl. 7, figs. 4, 5.

Shell rimate, oblong conic, very thin, hyaline, pale citron-colored, very finely striated, the spire acute. Whorls 7, a little convex, the last half the length of the shell. Aperture ovate-oblong, lip acute, columella slightly twisted. Length 6, width 2 lines (*Phil.*). Length 12, diam. 5, aperture 6⅓x3 mm. (*Pfr.*).

Guinea.

Bulimus guineensis Jonas, PHILIPPI, Abbild. u. Beschreib. neuer Conch., i, p. 54, pl. 1, f. 4 (Oct., 1843).—PFR., Monogr., ii, p. 178.—REEVE, C. Icon., v, pl. 86, f. 641.—*Bulimus guinaicus* BOURGUIGNAT, Malac. de l'Abyssinie, p. 65, in Ann. des Sci. Naturelles, Zoölogie, xv, 1883 (new name).

The outer lip is weakly arched forward. It is more slender than *C. sulcata*, very fragile and transparent.

10. C. TERRULENTA (Morelet). Pl. 9, figs. 42, 43.

Shell finely perforate, ovate-conic, rather thin, slightly shining, sculptured with close delicate riblets; corneous-brownish. Spire conic, the apex somewhat obtuse. Whorls 7, convex, joined by an impressed suture, the last whorl obscurely angular at the base, slightly more than one-third the length of the shell. Aperture oval; peristome acute, unexpanded, the right margin arcuate, columellar margin dilated, narrowly expanded. Length 11, diam. 5 mm. (*Morel.*).

Lope, on the banks of the river Ogooue (Ogowe), Gaboon (French Congo).

Bulimus terrulentus MOREL., Journ. de Conchyl., 1883, p. 398, pl. 10, f. 3.

The surface sculpture consists of an oblique, regular, dense and low costulation. This species may be an *Opeas;* it seems not to have the sinuous peristome of *Curvella.*

East African Species.

C. subviridescens is imperforate; the others are more or

less perforate or umbilicate, and are here arranged by size, from larger to smaller, in the absence of data sufficient for a natural grouping.

11. C. SUBVIRIDESCENS (E. A. Smith). Pl. 9, fig. 41.

Shell imperforate, elongate, thin, glossy, subpellucid, pale greenish. Whorls 7, slightly convex, sculptured with curved growth-striæ; spire obtuse at the apex. Suture slightly oblique, distinct; aperture inversely subauriform, five-thirteenths the length of the shell; lip very thin, projecting in the middle, curved. Columella somewhat twisted, whitish, slightly and delicately reflexed, joined to the outer lip by a delicate callus. Length 14, diam. 5⅓, aperture 5 mm. long, 2½ wide (*Smith*).

Mamboia, 4,000 to 5,000 ft. elevation (Last).

Bulimus (*Hapalus*) *subviridescens* SMITH, Ann. Mag. N. H. (6), vi, p. 156, pl. 5, f. 12 (August, 1890).

"This is a more slender species than *Hapalus grateloupi* Pfr., the type of the group, has a somewhat shorter body whorl, and a less distinct spiral curve on the columella. In one of the specimens there are about half a dozen roundish eggs, which are seen through the transparency of the shell, as in many species of *Stenogyra*" (*Smith*).

12. C. SINULABRIS (Martens). Pl. 8, figs. 25, 26.

Shell perforate, elongate, thin, sculptured with incised arcuate striæ, somewhat shining, pale yellowish; apex obtuse. Whorls 8, the first convex, following ones nearly flat, the last whorl oblong, tapering at the base, perceptibly descending in front. Aperture oblong, acutely angular above, narrowly rounded below, the outer margin unexpanded, thin, arcuate, sinuously receding at the insertion; columellar margin dilated, reflexed, half covering the perforation. Length 18 to 18.5, diam. 6, aperture 6.5 to 7 mm. long, 3 wide (*Martens*).

Kipopotue in Ukamba (Hildebrandt).

Stenogyra (*Opeas*) *sinulabris* MARTENS, Monatsberichte d. Akad. d. Wissensch. in Berlin, 1878, p. 295, pl. 2, f. 3, 4.—*Hapalus s.*, MARTENS, Beschalte Weichthiere, p. 130.

"The arcuate, forwardly bowed growth-lines, the reflexed columellar margin, the delicate, transparent structure of the shell, and small number of whorls for a Stenogyra, indicate the natural position of this species in the genus *Hapalus,* where it belongs next to *subviridescens* and *elongatus.* The structure of the radula, especially the small size of the middle tooth, which formerly led me to place the species in *Stenogyra,* also agrees with *Hapalus* according to the latest researches. *Stenogyra javana* Rve., *Opeas semperi* Hid. and *O. ternatana* Bttg. are closely related to this species and may well belong also to *Hapalus*" (*Martens*).

13. C. SUTURALIS (Martens). Pl. 8, fig. 20.

Lanceolate, with very narrow but circular umbilicus and moderately strong striæ, bent back below the suture; whitish; 7 whorls, regularly increasing, *the suture being bordered below by a somewhat raised girdle which is bounded by a groove;* the last whorl gradually tapering downwards, obliquely descending to the mouth. Aperture scarcely oblique, less than half the length of the shell, acute-angularly elliptical with unexpanded, simple margins. Outer lip arcuate above, lower margin narrowly rounded, columellar margin thickened and strongly twisted, reflexed above and appressed, half closing the umbilicus, and continued as a distinct layer upon the parietal wall. Length 14, diam. 5.5, aperture 6.5 mm. long, 3 wide (*Martens*).

Kitohaui, on the plateau between Ukuledi and Umbekuru, in the district of Mgao, southwestern part of the German Protectorate (Lieder).

Hapalus suturalis MARTENS, Beschalte Weichthiere, p. 129, pl. 5, f. 15.

14. C. DISPARILIS (E. A. Smith). Pl. 8, figs. 16, 21.

Shell perforate, ovate, a little acuminate above, whitish or waxen, glossy. Whorls 6, slightly convex, parted by a light, oblique suture, longitudinally sharply striated, the striæ curved, more or less vanishing below; last whorl large, rather swollen; apex rather obtuse. Aperture long, inversely auri-

form, more than half the total length of the shell; lip thin, prominent in the middle, curved, incised or sinuate at the suture. Columella slightly oblique, expanded and reflexed, slightly twisted. Length 13, diam. 6.5, aperture 6⅔ mm. long, 3 wide (*Smith*).

Mamboia, 4,000 to 5,000 ft. elevation (Last); Butumbi; west side of Runssoro, 1,175 meters, on the Itiri river, etc. (Stuhlmann).

Bulimus (*Hapalus*) *disparilis* Smith, Ann. Mag. N. H. (6), vi, p. 156, pl. 5, f. 13 (Aug., 1890).—*Hapalus d.*, Martens, Beschalte Weichthiere, p. 128, with fig. of genitalia; pl. 1, f. 12, shell.

"In the single specimen from the above locality the striæ upon the upper whorls are strongly marked near the suture above, and become weaker towards the lower part. On the last volution, however, the striæ are equally strongly incised all over the surface, being especially distinct near the outer lip. There is a slight depression below the suture in this whorl, but it may only be an individual peculiarity.

In three specimens collected by Sir J. Kirk in Usagara, which are smaller than the type, the striæ are still stronger and continue from suture to suture. They also differ in having the whorls slightly more convex and in being imperforate; but this may be due to the immaturity. Notwithstanding these differences, on placing them side by side they all appear to belong to the same species" (*Smith*).

Dr. Stuhlmann noted that the soft parts are pale citron-yellow, the tentacles light reddish. Length of the foot 10 mm. It always contained eggs. The columella of the shell, in those collected by Dr. Stuhlmann, was always more or less twisted, and they are a little more slender than Smith's type; but in all other respects they agree well. The impressed, arcuate striæ are especially well developed in this species. The genitalia, from a drawing by Schako, are figured, f. 16.

15. C. kretschmeri (Martens). Pl. 8, fig. 17.

Shell long-lanceolate, with the umbilicus not very narrow, with weak striæ somewhat bent back below the suture; whit-

ish. Whorls 7, regularly increasing, pretty flat, only a little convex below the suture, the last whorl rounded beneath, descending to the aperture. Aperture scarcely oblique, much less than half as long as the shell, piriform, with unexpanded, simple margins. Outer lip weakly arched above, more so below; basal margin narrowly rounded; columellar margin thickened, triangularly expanded and reflexed, not covering the umbilicus. Length 12, diam. 5 mm., aperture 5 mm. long, 3 wide (*Martens*).

British East Africa, Dschala Lake, southeast of Kilima-Njaro (Dr. Kretschmer).

Hapalus kretschmeri Martens, Beschalte Weichthiere D. O.-Af., p. 129, pl. 5, f. 22.

"Midway between *H. disparilis* and *H. delicatus*, being narrower than the former, fuller and wider than the latter."

16. C. conoidea (Martens). Pl. 8, fig. 18.

Shell conic-ovate with circular umbilical opening and impressed arcuate lines, which distinctly bend back near the suture; somewhat glossy, yellowish-white. Six regularly increasing whorls with moderately deep suture, the last whorl rounded beneath, not conspicuously deflexed in front. Aperture vertical, piriform; peristome simple, the outer margin forwardly convex, basal margin rounded, columellar margin somewhat dilated and expanded outwardly. Length 10, diam. 5.5, aperture 4.5x2.5 mm. (*Marts.*).

East Africa: Migere in Butumbi, on the south shore of the Ngesi, in leaf-mould of the forest (Stuhlmann).

Hapalus conoideus Marts., Sitz.-Ber. d. Ges. nat. Freunde, 1892, 177; Beschalte Weichthiere D. O.-Afr., p. 129, pl. 5, f. 14.

Differs from the other species by its open umbilicus and the rather dilated columellar margin, but it shows the characteristic arcuate striation of the genus.

17. C. nyasana Smith. Pl. 9, fig. 50.

Shell elongate, ovate-conoid, whitish, subpellucid, narrowly umbilicate, sculptured with strongly curved, riblet-like

growth-lines. Spire elongate-conic, obtuse at the apex. Whorls 6 to 6½, a little convex, regularly, slowly increasing, separated by a lightly oblique suture. Aperture ovate, acuminate above, about half the total length; peristome thin, the right margin prominently curved in the middle, deeply receding to the suture; columellar margin oblique, broadly expanded and reflexed. Alt. 12.5, diam. 6.5, aperture 6x3 mm. (*Smith*).

British Central Africa: Mt. Chiradzulu, Masuku plateau, 6,000-7,000 ft.; Nyika range, 7,000 ft.

Curvella nyasana Sm., P. Z. S., 1899, p. 588, pl. 33, f. 44.

"This species may prove to be the same as *Hapalus conoideus* of Martens, but judging from the figures, it seems to be longer and narrower with a more produced and less pointed spire."

A variety from Zomba Plateau is "larger than the type, wider, the spire shorter, the upper whorls shorter; length 18.5, diam. 11 mm."

18. C. associata (E. A. Smith). Pl. 8, fig. 19.

Shell elongate, narrow, scarcely perforated, glossy, whitish or waxen. Whorls 6, convex, slowly widening, sculptured with strong, regular, close, subhorizontal, slightly curved striæ; separated by a slightly oblique suture; the last whorl small. Aperture small, about three-eighths the total length; lip thin, lightly arcuate; columella slightly twisted, expanded and reflexed, joined to the outer lip by a thin callus. Length 7.5, diam. 3⅓ mm.; aperture 3 mm. long, 1.5 wide (*Smith*).

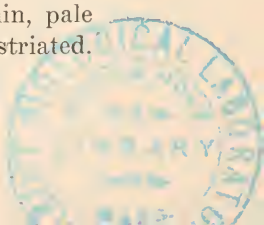
Mamboia, 4,000-5,000 ft. elevation (Rev. Last).

Bulimus (*Hapalus*) *associatus* Smith, Ann. Mag. N. H. (6), vi, p. 157, pl. 5, f. 14 (Aug., 1890).

"This species has the sculpture very like that of *Hapalus disparilis*, but is quite distinct on account of its very different form."

19. C. whytei Smith. Pl. 9, fig. 47.

Shell elongate, obtuse at the apex, imperforate, thin, pale straw-colored, glossy, very delicately arcuately striated.



Whorls 6 to 7, a little convex, parted by an oblique suture, the last whorl long. Aperture vertical, inversely auriform; peristome thin, simple, the columellar margin reflexed, appressed, the right margin projecting, curved. Length 12.5, diam. 4.33, aperture 4.33x2 mm. (*Smith*).

Mount Chiradzulu and Zomba Plateau, 5,000 ft.

Curvella whytei Sm., P. Z. S., 1899, p. 588, pl. 33, f. 45.

"Martens writes concerning this species: 'Distinct from all my species by its slender form; *C. delicata* the nearest, but also somewhat broader than yours.' "

20. C. DELICATA ('Gibbons' Taylor). Pl. 8, figs. 33, 34, 35.

"Shell conic-turrite, elongate, very thin, semi-transparent, glossy, of a pearly-gray color, clouded and rather opaque in places, finely but very distinctly striulate transversely, the striulæ rather curved, with the convexity towards the aperture; *epidermis* very thin; *whorls* 7-8, rather tumid, rapidly enlarging, especially after the fourth or fifth whorl, the last being much the largest and most tumid; *apex* rather obtuse; *suture* deep and distinct; *mouth* rather narrow, ovate, somewhat oblong, *lips* almost parallel, *outer* thin and sinuous, inner slightly reflected behind anterior end of aperture, rounded; *umbilicus* narrow but rather deep. Length 0.275, breadth 0.093 inches" (*Taylor*).

Zanzibar (Gibbons, Schmidt); Derema, Ussambara (Conradt), Monyonyo, Uganda (Emin Pasha).

Opeas delicata Gibbons MS., Taylor, Quart. Journ. of Conch., i, p. 281, pl. 3, f. 3.—*Hapalus d.*, Martens, Beschalte Weichthiere, p. 130, p. 5, f. 16, with var. *gracilior*.

"Rather diffused around Zanzibar, but not common; usually under stones. A number were found by Mr. Gibbons in the interstices of a small piece of coral, lying on the ground under a tree; a few yards away great quantities of dead and old shells were lying among the grass, near some bushes.

"In March this species contains 3 or 4 large calcareous-shelled eggs" (*Taylor*).

Var. *gracilior* Martens. Length 7, diam. 2.5, aperture 2.5x

1.33 mm. Ongenya, west of the Semliki river, in the forest region, in mould of a banana plantation.

South African Species.

21. C. CALOGLYPTA Melvill & Ponsonby. Pl. 8, fig. 22.

Shell ovate, subrimate, thin, subpellucid. Whorls 5, including the depressed, minute, apical one, all impressed at the suture, gradate-ventricose, longitudinally very closely and obliquely lirate throughout. Last whorl much larger than the preceding. Aperture ovate; peristome thin, the columellar margin a little thickened, triangularly reflexed. Length 4.5, diam. 3 mm. (*M. & P.*).

Otto's Bluff, near Pietermaritzburg, Natal (Burnup).

Curvella caloglypta M. & P., Ann. and Mag. N. H. (7), viii, p. 320, pl. 2, f. 12.

"From the three *Curvellæ* hitherto found in the South African region, *C. catarractæ, sinuosa,* and *globosa* M. & P., this most delicate species differs in the more quadrate whorls, compressed sutures, and especially in the close and regular oblique longitudinal liration, which needs, of course, a lens to bring out its beauty. It has only hitherto been found in very small quantity" (*Melvill & Ponsonby*).

22. C. CATARRACTÆ (Melvill & Ponsonby). Pl. 8, fig. 23.

Shell ovate-fusiform, translucent, very thin, smooth, very pale corneous-olivaceous. Whorls 5, the apical one obtuse, the last rapidly increasing, a little inflated, immaculate. Aperture small, ovate; outer lip thin, simple; columella rather straight, triangularly reflexed over the umbilical region. Length 4.5, diam. 2.5 mm. (*M. & P.*).

Howick, a waterfall near Pietermaritzburg, Natal.

Hapalus catarractæ M. & P., Ann. & Mag. N. H. (6), xix, p. 635, pl. 17, f. 4.

23. C. CROSLYI Burnup. Pl. 8, figs. 27, 28.

"Shell imperforate, fusiform, white, thin, shining; with 6 whorls, the last three being more ventricose than the others, slightly impressed at the sutures, irregularly ornamented with

curved, transverse striæ, which are crossed by a greater number of regular, microscopic, spiral striæ, the last whorl being less than the spire; aperture ovate; labrum thin, simple, well arched forward in the middle, labium thickened and thrown back, quite covering and closing the umbilicus; columella slightly curved obliquely to the left; callus-scar extending from the suture well above the columella, and completely covering the umbilical region. Long. 6.5, lat. 2.75 mm. (*Burnup*).

Makowe, Zululand, Natal (J. Crosly).

Curvella croslyi Burnup, Proc. Malac. Soc. London, vi, 1905, p. 302, pl. 16, f. 3, 4.

"This beautiful shell is much the largest of the South African *Curvellæ* yet discovered, and I have much pleasure in naming it after the discoverer, Mr. J. Crosly.

"It is a thin, white, shining shell of six whorls, of which the last three are rather ventricose, and the upper three flatter. The irregular transverse sculpture, following the line of growth, which, like the outer lip, is well curved forward, is easily seen with a weak lens; while the fine spiral sculpture is only visible under a strong magnifier.

"With the type are four 'dead' specimens, probably not quite mature, the largest measuring only 10.5 mm. in length, in which the umbilicus is open and the callus not well developed, but in other respects they agree with the type. I have also before me two of the calcareous eggs which were syringed from the shell; they are white, nearly spherical, and measure about 1.3 mm. in diameter" (*Burnup*).

24. C. elevata Burnup. Pl. 8, figs. 29, 30.

"Shell elongate-conic, umbilicate, pale ashy straw-color, thin shining, translucent; with 6 slightly ventricose whorls, not much impressed at the sutures, the apex being blunt, and the last whorl 2.5 mm. of the length of the shell, very finely, irregularly sculptured with curved, transverse striæ, with traces of microscopic spiral lines over the umbilicus; columella paler, nearly straight, slightly bent to the left. Long. 6.5, lat. 3 mm. (*Burnup*).

Grahamstown, Cape Colony (J. Farquhar).

Curvella elevata BURNUP, Proc. Malac. Soc. London, vi, 1905, p. 304, pl. 16, f. 10, 11.

"Broader at the periphery, which is situate lower on the body-whorl and with straighter sides, and therefore of more pyramidal outline, this shell is more elegant in form than either of the preceding allied species, *C. straminea* and *C. succinea,* from which it is easily distinguished" (*Burnup*).

In the above description, in place of "last whorl 2.5 mm. of the length of the shell" should probably be read, "last whorl contained 2.5 times in the length of the shell."

25. C. GLOBOSA (Melvill & Ponsonby). Pl. 8, fig. 31.

Shell ashy-white, glossy, thin, inflated, ovate. Whorls 6, the apical one obtuse, the rest rather swollen, almost smooth, under a lens seen to be irregularly striatulate longitudinally; the last whorl large, inflated. Aperture ovate; peristome thin, with a wedge-shaped narrowly reflected process over the umbilicus, which is very narrow. Length 6, width 3 mm. (*M. & P.*).

Stella Bush.

Hapalus globosus M. & P., Ann. Mag. N. H. (7), ii, p. 128, pl. 7, f. 6 (August, 1898).

It differs from *H. catarractæ* in substance, color, greater inflation of whorl, and one or two other particulars.

26. C. SINUOSA Melvill & Ponsonby. Pl. 8, fig. 32.

Shell fusiform, glossy, thin, pale and bright straw-color. Whorls (including the papillar, obtuse, and very smooth apex) 7, impressed at the sutures, nearly smooth, under a lens longitudinally flexuous-striatulate. Aperture ovate; peristome sinuous, simple, the columellar margin straight. Length 6.5, diam. 3 mm. (*M. & P.*).

Umkomaas, Natal.

Curvella sinuosa M. & P., Ann. and Mag. N. H. (7), iv, p. 198, pl. 3, f. 12 (Sept., 1899).

"An elegantly fusiform Curvella, quite distinct from the two other recently described species (*catarractæ* and *globosa*

M. & P.), but equally delicate and remarkable. The chief peculiarity of the shell now before us is, as indicated by its specific name, the sinuous lip."

27. C. STRAMINEA Burnup. Pl. 8, figs. 36, 37.

Shell oblong-ovate, umbilicate, thin, shining, straw-colored, subtranslucent; with 5½ rather ventricose whorls, impressed at the sutures, ornamented with close, clear, fine, arched, transverse striæ; aperture oval; peristome thin, simple, triangularly reflexed over the narrow umbilicus; columella and callus white, the former being slightly curved inwards at the base. Length 6.5, width 2.75 mm. (*Burnup*).

Walmer, near Port Elizabeth, Cape Colony (Miss Hickey). Several specimens.

Curvella straminea H. C. BURNUP, Proceedings Malacological Society of London, vi, 1905, p. 303, plate 16, figs. 5, 6.

This pretty little species is more elongate and slender than its South African allies, and is conspicuous by its straw-color and distinct sculpture, which follows the arcuate contour of the outer lip (*Burnup*).

28. C. SUCCINEA Burnup. Pl. 8, figs. 38, 39.

"Shell oblong-ovate, narrowly umbilicate, pale horn-color, thin, shining, translucent; with 5½ slightly ventricose whorls; not much impressed at the sutures, nearly smooth, with faint, and very slightly curved, transverse sculpture crossed with very close, microscopic, spiral striæ; apex rather blunt; aperture oval, about one-third of the length of the whole shell; peristome thin, simple, reflexed, and entire, covering, but not closing, the umbilicus; columella and callus pale straw-color. Length 5.75, width 2.5 mm." (*Burnup*).

Maeström Forest, Bedford, Cape Colony (J. Farquhar).

Curvella succinea H. C. BURNUP, Proc. Malac. Society London, vi, 1905, p. 303, pl. 16, f. 7, 8.

"This delicate little shell, though much resembling in general appearance the last species described (*C. straminea*), is easily distinguished from it by its smaller size, richer color, smoother surface, less ventricose whorls, and shallower

sutures, while the fine, microscopic, spiral striæ, only to be seen with the aid of a strong lens, are not traceable in *C. straminea*, and the characteristic arch of the outer lip is not so pronounced in this as in the last-named species'' (*Burnup*).

Species of India, Farther India and China.

C. plicifera, no. 29, has an entering parietal lamella. Its generic position is doubtful.

Hapalus travankoricus Theobald, Journ. As. Soc. Beng., 1876, xlv, pt. 2, p. 186, pl. 14, f. 5, is according to Blanford the young of *Cataulus calcadensis* or some closely related species. See J. A. S. B., xlix, pt. 2, p. 215 (1880).

29. C. PLICIFERA (Blanford). Pl. 9, fig. 45.

''Shell obtectly perforated, ovately conical, rather thin, horny, finely striated. Spire conical, apex obtuse, suture marginate, scarcely impressed. Whorls 5, planulately convex above, the last longer than the spire, somewhat tumid, rounded at the base. Aperture vertical, truncately oval, subpiriform; peristome simple; right margin curved forwards; columella callous, subvertical, slightly curved, rather broadly reflexed; margins united by a callus bearing a small re-entering lamella about the centre. Length 9, diam. 5.5 mm.'' (*Blanford*).

Thayet Myo, Pegu; rare.

Bulimus plicifer W. T. BLANFORD, Journ. Asiat. Soc. Bengal, xxxiv, pt. 2, p. 77.—PFR., Monogr., vi, p. 151.—HANL. & THEOB., Conch. Indica, pl. 80, f. 8.

''A more tumid shell than *B. putus* Bens., and easily distinguished from all other Indian and Burmese forms of the genus by the re-entering parietal plait.''

The systematic position of this species is uncertain. I have not seen specimens.

30. C. PUTA (Benson). Pl. 9, fig. 46.

Shell perforate, ovate-acute, thin, striatulate, whitish under a thin corneous epidermis. Spire conic, the apex rather obtuse, suture well impressed. Whorls 6, convex, the last slightly exceeding half the shell's length. Aperture vertical,

semioval, rather large; peristome acute, unexpanded, the columellar margin reflexed. Length 7, diam. scarcely 5 mm.; aperture scarcely 4 mm. long, 2.5 wide (*Bens.*).

Tavoy (Theobald); Pegu (Blanford).

Bulimus putus Bens., Ann. and Mag. N. H. (2), xix, p. 330 (April, 1857).—Pfr., Monogr., iv, p. 502.—Hanley & Theobald, Conch. Indica, pl. 80, f. 9.—*Hapalus putus* Nevill, Handlist Ind. Mus., p. 175.

31. C. pusilla (Blanford). Pl. 9, fig. 48.

"Shell imperforate, ovate, thin, yellowish-white, costulately striated. Spire conically pyramidal; sides straight; apex rather acute; suture impressed. Whorls 5, convex, the last longer than the spire (ratio = 4:3) and rounded beneath. Aperture rather oblique, subpiriform; peristome simple, acute, much curved forwards on the right margin; columella scarcely twisted, reflexed, appressed on the whorl. Length 6, diam. 3.5, length of aperture 3.2 mm. (*Blanf.*).

Prome district, Pegu.

Spiraxis pusilla Blanf., Contrib. to Ind. Malac., v, Journ. Asiat. Soc. Beng., xxxiv, pt. 2, p. 78.—*Bulimus pusillus* Hanl. & Theob., Conch. Ind., p. xi, pl. 79, f. 8.—Pfr., Monogr., vi, p. 192.

"I am not quite sure if all of the few specimens I possess of this peculiar small form came from Akoutoung, or whether some may not be from Thayet Myo. The shell resembles young specimens of *Bulimus putus* Bens. so closely that it can only be distinguished by the absence of any perforation."

32. C. scrobiculata (Blanford). Pl. 9, fig. 49.

"Shell subobtectly perforated, turritedly ovate, thin, horny, yellowish-white, marked with vertical, subarcuate, rather irregular, closely set, raised lines. Spire turrited, apex obtuse, suture simple, impressed. Whorls 6, convex, the last rounded beneath. Aperture vertical, truncately ovate; peristome simple, thin; right margin considerably curved forwards; columellar vertical, curving to the left near the base, frequently straight, rather broadly reflexed. Length 7, diam. 3.5, length of aperture 3.5 mm." (*Blanf.*).

Pegu, west of the Irawady (Blanf.).

Bulimus scrobiculatus Blanf., Journ. Asiat. Soc. Bengal, vol. 50, pt. 2, p. 77, 1865.—Pfr., Monogr., vi, p. 151.—Hanley & Theob., Conch. Indica, pl. 79, f. 9.—*Hapalus s.*, Nevill, Handlist Ind. Mus., p. 179.

"The nearest ally of this species is its congener *B. putus* Bens., which inhabits the same localities, and differs in its greater tumidity and less marked sculpture. There is, however, much variation in the first-named character, and despite the great difference between the two forms in general, there is some appearance of a passage. Two specimens of *B. putus* which I possess, measuring respectively 7 and 8½ millm. in length, are both 5 millm. in diameter."

33. C. munipurensis (Godwin-Austen). Pl. 9, figs. 51, 52.

"Shell rimate, elongately turrited, thin, covered with a pale ochre or straw-colored epidermis, and strongly and obliquely striated; spire turrited, apex blunt; whorls 7½, convex, suture strongly impressed; aperture oblique, rounded below, milky-white inside; peristome acute, outer and upper margin arched well forward; columellar margin straight, strong, and slightly twisted forward; a thin white callus on the parietal margin. Animal pale orange, fainter tint above the head; foot short; eye-peduncles short, swollen at the base, lower tentacles very blunt projections."

"Alt. .88, diam. .30; apert. alt. .35, apert. lat. .17 inch."

Hengdan Peak, on the Munipur boundary, 7,000 ft. elevation, among dead leaves in forest.

Bulimus (*Harpalus*) *munipurensis* G.-A., P. Z. S., 1872, p. 516, pl. 30, f. 8.—Theob. & Hanl., Conch. Ind., p. 59, pl. 148, f. 1, 4.—*Bulimus m.*, Pfr., Monogr., viii, p. 182.—*Hapalus m.*, Nevill, Handlist Ind. Mus., p. 174.

34. C. khasiana (Godwin-Austen). Pl. 9, figs. 53, 54, 55, 58.

"Shell subperforate, ovately turrited or acutely ovate, thin, diaphanous, fresh specimens often glassy, becoming dull white or pale straw-color with age; minutely striated under lens; spire conical, apex blunt, suture moderate; whorls 6-7, slightly

convex, the body-whorl large and tumid; aperture vertical, semi-oval; peristome simple, sharp, rounded and arched considerably forward at the upper angle, the columella is curved forward from behind and the margin slightly reflected."

"Animal with a short foot pointed behind, pale yellow tint, eye-tentacles dark to the base, lower very short" (*G.-A.*).

Alt. .59, diam. .28, apert. .29x.16 inch (N. Cachar Hills).

Alt. .41, diam. .20, apert. .23x.12 inch (Cherra-Poonjee).

Khási, Jainta, and Nágá Hills, in the deep shady forest among decaying wood and leaves at the foot of trees; Dikrang valley, Dafla Hills, 2,500 ft. (G.-A.).

Bulimus (*Harpalus*) *khasianus* G.-A., P. Z. S., 1872, p. 516, pl. 30, f. 7, 7*a*.—Theob. & Hanley, Conch. Ind., p. 59, pl. 148, f. 7.—*Bulimus k.*, Pfr., Monogr., viii, p. 183.—*Hapalus k.*, Nevill, Handlist Ind. Mus., p. 174.—*Bulimus* (*Harpalus*) *khasiacus* G.-Austen, Journ. Asiat. Soc. Beng., xlv, pt. 2, p. 317 (1876).

"It appears to be very close to *Bul. putus* Bs. (Annals and Mag. Nat. Hist., April, 1857), from Tavoy. Specimens differ very much in size from different collections. The shell is very finely developed in the high parts of the North Cachar Hills at 6,000-7,000 ft. (fig. 53). At Cherra-Poonjee it seems a more tumid form (fig. 55), and it is very frequently dwarfed to the length of only 0.36 inches, especially in its lower habitats; but these variations are not of sufficient specific importance."

35. C. sikkimensis (Reeve). Pl. 9, figs. 59, 60.

Shell ovate, somewhat inflated; spire rather short, obtuse at the apex; whorls 4 in number, the last much the largest, concentrically finely striated; sutures impressed; columella slightly twisted, thinly reflected; aperture oblong, slightly sinuated at the upper part; pale olive, semi-transparent (*Rve.*).

Shell slightly perforate, subfusiform-ovate, rather solid, closely plicate-striate, semipellucid, slightly shining, greenish-buff; spire pyramidal, obtuse; whorls 5, flattened, the last longer than the spire, tapering basally, subcompressed.

Aperture narrow, oblong, subangular above and at the base; peristome simple, unexpanded, the right margin lightly arcuate, columellar margin somewhat twisted, calloused, subreflexed. Length 7.75, diam. 3.75, aperture 4.75x2 mm. (*Pfr.*, from spec. in Benson coll.).

Darjeeling (Benson, Blanford, *et al.*).

Bulimus sikkimensis Reeve, Conch. Icon., v, pl. 87, f. 651, Feb., 1850 (young).—Pfr., Monogr., iii, p. 436.—Benson, Ann. & Mag. N. H. (3), v, p. 464.—Hanley & Theob., Conch. Indica, p. 10, pl. 19, f. 7 (adult).—*Hapalus s.*, Nevill, Handlist, p. 174.

The type was a very young shell (fig. 59). It attains a larger size, as figured in the *Conchologia Indica* (fig. 60), and described by Pfeiffer. According to Benson the species attains a size of 17 mm. long by nearly 10 diam., with 7 whorls.

36. C. jousseaumei (de Morgan). Pl. 9, figs. 56, 57.

Shell turriculate, thin, fragile, translucent, white, imperforate, smooth, ornamented with extremely fine lines of growth; composed of 5 to 6 regularly convoluted whorls. Aperture vertical, elliptical, widely invaded by the penult. whorl; peristome straight and acute; columellar margin reflexed as in *Spiraxis;* the outer edge forming a rounded projection in the middle. Length 7, diam. 3, length of aperture 2.5 mm. (*de Morg.*).

Perak: Gunong Tcheura, near Ipoh, Kinta (de Morg.).

Hapalus j., de Morgan, Bull. Soc. Zoöl. France, 1885, p. 372, pl. 5, f. 2.

37. C. boettgeri (Gredler). Pl. 9, fig. 44.

Shell small, imperforate, long-oval, thin, pellucid, very glossy, superficially and wide-spaced striatulate, waxy-whitish; apex obtuse. Whorls 7, rapidly increasing, very convex, the last about equal in length to the others together. Aperture large, ovate-piriform, perpendicular; columella twisted, receding at the basal sinus, peristome unexpanded, the columellar margin very short, reflexed at the insertion; outer

margin protracted, connected with the other by a very thin callus. Length 9, diam. 4, alt. aperture 4 mm. (*Gredl.*).

China: Li-uan, in the province Hunan (Fuchs).

Hapalus böttgeri Gredl., Archiv für Naturg., vol. 50, 1884, p. 270, pl. 19, f. 2; Malak. Bl. (n. F.), ix, 141.

Resembles *C. grateloupi* in miniature.

Philippine and East Indian Species.

a. Shell imperforate, species 38 to 40.

b. Shell rimate, perforate or umbilicate, species 41 to 45.

38. C. grateloupi (Pfeiffer). Pl. 6, figs. 68, 69.

Shell imperforate, ovate-oblong, rugulose-striate, very thin, glossy, pellucid, straw-whitish. Whorls 6 to 7, a little convex, the last a little shorter than the spire; columella callous, bent backwards. Aperture semi-oval; peristome acute, simple, the right margin arching forwards. Length 18, diam. 8, aperture 9x4.5 mm. (*Pfr.*).

Philippine Is.: Albay, Luzon and Dingle, Panay (Cuming); Luzon, Katanduanes, Samar, Leyte, Cebu, Guimaras, Panay (*Mlldff.*).

Bulimus grateloupi Pfr., P. Z. S., 1846, p. 42; Monogr., ii, p. 169; Conch. Cab., p. 240, pl. 63, f. 19, 20.—Reeve, C. Icon., v, pl. 14, f. 81.—*Stenogyra grateloupi* Pfr., Semper, Reisen, p. 139.—*Hapalus grateloupi* Pfr., Mlldff., Syst. Verzeich., Abh. Naturf. Ges. zu Görlitz, xxii, 1898, p. 154; Jahrb. D. M. Ges., xiv, 280; Bericht. Senck. Ges., 1890, 244.

39. C. decurtata (Quadr. & Mlldff.).

Shell imperforate, ovate-conic, thin, pellucid, very finely curve-striatulate, glossy, yellowish-white. Spire convex-conoid, the apex obtuse. Whorls 5½, a little convex, parted by an appressed, distinctly margined suture, the last whorl a little tumid, as long as the spire. Aperture slightly oblique, rounded-rhomboidal; peristome unexpanded, acute, the right margin arcuate, receding above; columella callous, somewhat twisted. Length 10.5, diam. 6 mm. (*Mlldff.*).

Luzon, Mt. Mariveles (Q. & M.).

Hapalus decurtatus Q. & M., Nachrbl., 1895, p. 118.

40. C. BREVIS (Quadr. & Mlldff.).

Shell imperforate, ovate-oblong, finely arcuately striate, somewhat shining, hyaline. Spire moderately elevated, the sides a little convex, the apex obtuse. Whorls 6, a trifle convex. Aperture slightly oblique, rounded-rhombic; peristome unexpanded, acute; columella strongly twisted, callous, appressed above. Length 8.6, diam. 4.5 mm. (*Mlldff.*).

Philippines: Bohol.

Hapalus brevis QUADRAS & MLLDFF., Nachrbl. D. M. Ges., xxviii, p. 87 (August, 1896).

41. C. QUADRASI (Möllendorff).

Shell very narrowly and half-covered perforate, ventricose-fusiform, thin, pellucid, arcuately striatulate, pale straw-colored. Whorls 7, slightly convex, separated by a suture somewhat appressed and marginated, the last whorl a little more convex and descending forwards. Aperture slightly oblique, truncate-oval; peristome simple, acute, the upper margin receding a little towards the insertion; columellar margin reflexed, dilated above, nearly closing the perforation. Length 14.5, diam. 5.75 mm. (*Mlldff.*).

Northern Luzon, at the villages Magapig, Alcala, Gattaran and Napayacan (Quadras).

Hapalus quadrasi MLLDFF., Nachrbl. d. Mal. Ges., 1893, p. 177.

42. C. SCALARIS (Quadr. & Mlldff.).

Shell rimate, rather ventricosely turrited, thin, transversely very lightly striatulate, decussated with very close spiral lines, hirsute with a very short pile, visible under a strong lens, silky, pale straw-colored. Spire much lengthened, regularly conic, gradate, the apex obtuse. Whorls 8, moderately convex, separated by a deeply impressed suture. Aperture but little oblique, elongate, roundly rhomboidal, peristome simple, unexpanded, the outer margin moderately arcuate, columellar margin dilated above, a little reflexed. Length 18.5, diam. 7.5 mm. (*Mlldff.*).

Philippines: Catanduanes; also at the village Caramuan, Luzon.

Hapalus scalaris Q. et Mlldff., Nachrbl., 1895, p. 117.

43. C. perforata (Moellendorff). Pl. 9, figs. 61, 62, 63.

Shell perforate, turrite-ovate, rather solid, waxen, opaque; spire regularly turrited, the apex rather acute. Whorls 6 to 7, a little convex, rather rapidly increasing, parted by an impressed suture; microscopically costulate-striate, the striæ strongly sigmoid, and decussated by minute spiral lines, almost granulose. Last whorl spirally compressed below the suture, base regularly rounded; more than half the length of the shell. Aperture slightly oblique, at the base a little receding, irregularly piriform, broadly channelled above, impressed at the sinulus; peristome simple, acute, the upper margin deeply receding at the suture, then almost angularly roundly arching forwards; columellar margin dilated, half covering the perforation, the margins joined by a distinct callus. Columella long, straight. Length 20, diam. 10¼, aperture 10¼x6¼ mm. (*Mdllff.*).

Luzon: Montalban, province of Manila.

Hapalus perforatus Mlldff., Bericht. Senck. Ges., 1890, p. 246, pl. 8, f. 7.

Distinguished from *H. gratcloupi* by the perforation, but this is much narrower than in *H. umbilicatus*, from which it further differs in the fine granulation, visible only under a lens, which gives the shell a dull appearance, *H. umbilicatus* being glossy.

44. C. philippinica Pilsbry, n. sp. Pl. 6, figs. 66, 67.

Shell narrowly umbilicate, thin, oblong-conic, corneous-subopaque. Spire with nearly straight sides and very obtuse apex. Whorls 5½, rather convex, parted by a deeply incised suture, which is bordered below by a white line. The surface appears somewhat dull, and is sculptured with fine, irregular, close growth-striæ, which are everywhere weak, but are a little stronger and conspicuously arcuate below the suture on the last whorl. Aperture vertical, irregularly piriform or drop-

shaped, acuminate above, well rounded basally. Outer lip strongly arched forward above, retracted to the suture. Columella slightly concave, its edge well reflexed, dilated above.

Length 10.2, diam. 4.8, alt. aperture 5 mm.

Length 10, diam. 4.5, alt. aperture 4.8 mm.

Cagayan, Luzon. Types no. 58203 A. N. S. P.

C. umbilicata has a much wider umbilicus. *C. perforata* is about double the size, and has decussating spirals. In *C. philippinica* very faint traces of spiral striation may be traced in places on the last whorl. Both the wider (fig. 67) and the more slender specimens are illustrated.

45. C. UMBILICATA (Moellendorff). Pl. 9, figs. 64, 65.

Shell moderately umbilicate, conic-ovate, thin, glossy, hyaline; spire high conic, with convex sides and rather acute apex. Whorls 6, rather rapidly increasing, a little convex, parted by a deeply impressed suture, striatulate, the striæ strongly sigmoid; the last whorl about half the length of the shell, flattened above, rather swollen and somewhat baggy towards the base, subcompressed around the umbilicus. Aperture oblique, the base receding, irregularly drop-shaped, narrow above, base almost subangular; peristome simple, unexpanded, acute, the lip receding as it nears the suture, curved forwards in the middle. Columella dilated, a little protracted above, not thickened, the margins joined by a distinct parietal callus. Columella vertical, long and rather straight. Length 14, diam. 7⅔ mm.; aperture 8x4 mm. (*Mlldff.*).

Cebu, on the western coast.

Hapalus umbilicatus MLLDFF., Bericht. Senckenbergische naturf. Ges., 1890, p. 245, pl. 8, f. 6.

Conspicuously different from *C. grateloupi* by its open umbilicus.

Genus SUBULINA Beck, 1837.

Shell *imperforate,* at all stages of growth, narrow, turrited, or subulate, thin, corneous or brownish, usually more or less translucent; apex obtuse, rounded, the embryonic shell either

smooth, plicate below the sutures or vertically ribbed. Last whorl angular or rounded at the periphery. Aperture small, oblique, ovate, the *columella concave above, obliquely or abruptly truncate at base.* Eggs with a calcareous, oblately spheroidal capsule.

Distribution, tropical America and Africa; one species, *S. octona,* more widely spread by commerce.

Subulina in the modern sense is not widely distributed in the Old World, being confined to tropical Africa and the immediately dependent islands. It is closely related to *Homorus.* Some other genera, such as *Pseudoglessula* and *Bacillum* seem to belong to the same phylum. *Tortaxis* is probably descended from the *Subulina* stock, judging by the structure of the columella in the embryonic shell. At present we know too little of the soft anatomy of these forms to define their relationships with precision. The species are grouped as follows:

1. Generally distributed species, *S. octona,* no. 1.
2. Species of West Africa and the Congo Valley, no. 2 to 15.
3. Species of Northeast Africa, no. 16 to 19.
4. Species of East and Central Africa, no. 20 to 35.
5. Species of the Comoro Islands, no. 36 to 43.
6. The American species will be described in the second part of this volume.

1. S. OCTONA (Bruguiere). Pl. 12, figs. 8, 9.

Shell thin, translucent, yellowish corneous, turrited, almost regularly tapering to the obtuse summit, very glossy, rather coarsely and irregularly striatulate. Whorls 9, quite convex, separated by a deeply impressed suture, the first three turns of which are regularly crenulated by a border of short folds. On the later whorls it is also irregularly crenulate in places. Last whorl rounded. Aperture oblique, ovate; columella concave above, obliquely truncate at its base (Ternate specimen).

Length 19, diam. 4.6, aperture 4.3 mm., whorls 9 (Ternate).

Length 13, diam. 3.7, aperture 3.6 mm., whorls 7½ (Sumatra).

Length 12, diam. 3.3 mm., whorls 7½ (Seychelles).

Length 15.5, diam. 4 mm., whorls 8½ (Ceylon).

West African coast, Senegambia to Angola; Nossi-Be, Zanzibar and other East African islands; Ceylon (O. Collett!); Batu Sangkar, Sumatra (Harrison & Hiller, 1900!); Java; Manila; Moluccas; New Caledonia; New Hebrides. Also introduced in some European hothouses.

Achatina octona Morelet, Séries Conchyl. i, p. 72 (Zanzibar, Dr. Vesco, under rotten wood not far from the shore); Voy. Welwitsch p. 80, pl. 6, f. 5 (Golungo-Alto, Angola, etc., at elevation of 2000 ft.).—*Stenogyra octona* Chemn., Crosse, Journ. de Conchyl. 1889, p. 100 (Kanala, New Caledonia). Morelet, t. c. p. 363 (Madagascar).—Sell, Nachrbl. D. M. Ges. 1905, p. 40 (plant house in Copenhagen)—v. Martens in Webers Zool. Ergebnisse einer Reise in Niederländisch Ost-Indien ii, p. 244 (Padang, Sumatra; Weber).—Dautzenberg, Ann. Soc. Roy. Malac. Belg. xxxiv, Memoires p. 6, pl. 1, f. 3 (environs of Indrapoera, west coast of Sumatra, Dr. Weyers; also Mauritius, Seychelles and Zanzibar, M. Alluaud). —*Subulina octona* (Chemn.), Boettger, Bericht. Senckenberg. Ges. 1890, p. 147 (Gunung Salak, Java, Ad. Strubell); —1891, p. 273 (Amboyna and Haruku, in some quantity, Ad. Strubell).—Mlldff., Abhandl. naturforsch. Ges. Görlitz, 1898, p. 156 (Manila).—Boettger, Nachrbl. d. D. Malak. Ges. 1890, p. 90 (Loucoube and Nossi-Be, Ant. Stumpff; Seychelles).—Martens & Wiegmann, Seychellen-Mollusken, in Mittheil. Zool. Sammlung Mus. f. Naturkunde in Berlin, i, 1898-1900, p. 23 (Mahe, Seychelles, Dr. Brauer), p. 91 (Anatomy).—Martens, Beschalte Weichthiere D. Ost-Afrika, p. 123 (Zanzibar).—Sykes, Proc. Malac. Soc. Lond. v, p. 198 (Port Fila, Efate, New Hebrides, J. J. Walker).—Journ. of Malacology vii, 1898, p. 91 (Kew Gardens and Manchester, in hothouses).

Achatina crotallaria Schumacker, Essai d'un nouv. Syst. Test. Vers, p. 202.—*Subulina crotalaria* Schum., Moerch, Journ. de Conchyl. 1872, p. 337 (Tranquebar).—*S. crotalariæ* Schum., Beck, Index Moll. p. 77, no. 10 (Tranquebar).

Achatina mamillata Craven, Proc. Zool. Soc. Lond. 1880, p. 215, pl. 22, f. 8 (Nossi-Be, under dead leaves in woods

near the sea-shore).—*Subulina mamillata* Craven, Crosse, Journ. de Conch. 1881, p. 201 (Nossi-Comba, E. Marie).—Crosse & Fischer, Moll. Madag. pl. 24, f. 4.

The above references apply only to the occurence of *S. octona* in the Eastern Hemisphere.

It is generally and I believe correctly held that this species in the tropics of the Old World is an emigrant from America. Dr. Boettger has already remarked that it seems to have only lately invaded the Indo-Malayan and Papuan islands, for earlier and closely observant naturalists made no note of it. It appears first to get foothold in centers of trade and agriculture, and to spread with extraordinary rapidity into neighboring districts.

Subulina in a state of nature appears to be restricted to Africa and America; but by commerce *S. octona* has spread to the East Indies and as far as the New Hebrides. I have examined specimens from West Africa, the Seychelles, Ceylon, Sumatra and Ternate, and am satisfied of their identity with the Antillean *S. octona*. The *figures* on plate 12 are from Ternate shells. It was first noticed in New Caledonia in 1887 or 1888, appearing by thousands (Layard, P. Z. S. '88, 358).

Reproduction begins before the shell has attained two-thirds its maximum size, and usually several eggs may be seen through the shell within the penultimate whorl. The egg-capsules are hard-shelled, white and flattened, measuring 1.8 x 1.5 mm. (pl. 12, figs. 11, 12).

West African species.

2. S. moreleti Girard. Pl. 11, fig. 86.

Shell conic-turrited, thin, but slightly shining, covered with a dark reddish-brown epidermis, and ornamented from the summit with a quite prominent, narrow-spaced, nearly regular, straight and quite oblique costulation. Spire of 9 convex whorls, separated by a deep suture, the convexity decreasing from the first to the last. Summit quite acute. Last whorl obtusely carinate, occupying nearly a fourth of the

total length. Aperture rounded-oval, slightly subrhomboidal, quite oblique. Columella arcuate, a little obliquely truncate. Peristome simple, sharp, the outer margin straight in front. Length 12.5, diam. 3.75, aperture 3.5 x 2 mm. (*Girard*).

Prince Island, at Quilala-Faluiha at 500 meters elevation (F. Newton).

Subulina moreleti Girard, Jornal Sci. etc Lisboa, 1893, p. 104, pl. 1, f. 12.

This species seems to have much affinity to *S. muscorum* Morel. [Man. Conch. xvii, p. 161], but seems to differ by the more convex whorls, the last relatively a little smaller, and the columella more arcuate (*Girard*).

3. S. newtoni Girard. Pl. 11, fig. 87.

Shell subulate, thin, transparent, brightly glossy, pale yellow, with excessively fine growth-striæ which are quite irregular. Spire composed of 9 nearly flat whorls, separated by a well marked suture, and terminating in a rounded summit. Last whorl rounded, one-fifth the total length. Aperture oval, slightly oblique, columella arcuate, very obliquely truncate before reaching the base. Peristome simple, acute, the margins joined by a weak parietal callus. Length 20, diam. 4.5, aperture 4.5 x 2.5 mm. (*Girard*).

Prince Island: Ferreiro Velho, S. Joas and Quilala Faluiha, 1-500 meters elevation (Newton).

Subulina newtoni Girard, Jornal de Sciencias Math., Phys. e Nat. Acad. Real das sci. Lisboa, 1893, p. 104. pl. 1, f. 11.

4. S. striatella (Rang). Pl. 11, fig. 89, 90, 91, 92.

This shell is long, turrited, nearly cylindric, thin, translucent, with an epidermis of a slightly darkened dirty-yellow shade, especially towards the summit. The surface is finely and regularly striated throughout; the summit is obtuse, and the 9 whorls are rounded, with the exception of the last one, which is angular. The aperture is oval, small, its length nearly parallel to the axis of the shell, but its plane quite oblique. The columella is very concave and the right lip

simple and acute. The animal is dirty-white. Length 20 to 22, diam. 4 to 5 mm. (*Rang*).

Prince Island, at the foot of the mountains near the sea, in numbers under stones (Rang). St. Thome at Roca Boa Entrade and Rio do Ouro; also Ilheo das Rolas (Greef); numerous localities up to 750 meters (Newton). Also occurs on the mainland.

Helix striatella Rang, Ann. des Sci. Nat. xxiv, 1831, p. 38, pl. 3, f. 7.—*Achatina striatella* Morel., Ser. Conch. i, p. 26; Voy. Welwitsch, p. 79.—Greef, Zool. Anzeiger 1882, p. 519.—Pfr., Monogr. vi, p. 235.—*Stenogyra* (*Subulina*) *s.*, Dohrn, Malak. Bl. 1866, p. 127.—Crosse, Journ. de Conch. 1888, pp. 25, 302.—*Subulina striatella* Girard, Jornal de Sciencias Math., Phys. e Nat., Acad. Real das Sci. de Lisboa, (2) iii, p. 103 (August, 1893).—Wollaston, Testac. Atlantica p. 206 (Madeira, introduced).

Achatina petrensis Morelet, Journ. de Conch. xiv, 1866, p. 161; cf. Voy. Welwitsch p. 79.—Pfr., Monogr. vi, p. 235.

Dohrn, who distinguished *S. angustior* from *striatella*, gives the following diagnosis of the latter: Shell *turrited*, thin, whitish-waxen, glossy, longitudinally closely *rib-striate*, the striæ *oblique* to the axis; apex rather obtuse. Whorls 8 to 9, *a little convex*, the last scarcely one-fourth the total length, angular in the middle; columella arcuate, obliquely truncate. Aperture oval. Length 20, diam. 5.5, aperture 4.5 x 3 mm.

Plate 11, fig. 92 is a copy of Rang's original illustration.

A large series from Cape Palmas, Liberia, Senegal, and Prince Island is before me, none quite so large as the descriptions of Dohrn and Rang indicate. A Liberian shell figured (pl. 11, figs. 89, 90, 91) measures 18.5 mm. long, 4 wide, aperture 4 mm. long, this being about the maximum size in a series of some hundreds. The color is brownish-yellow. Sculpture of *very regular* rib-striæ, much weaker and in part disappearing below the angle of the last whorl. In fig. 90 they are too strong on the base. The first 2 whorls are nearly smooth and glossy, but show a regular crenulation below the suture, apparently representing the elsewhere vanished riblets, as in some species of *Homorus*. Whorls nearly 11. The

columellar truncation is strong but subvertical, and aperture quite oblique. This form may be readily separated from the *S. angustior* with which it seems usually to occur, by its more regular sculpture. Like *S. angustior*, it is oviparous, the eggs noticeably flattened or oblate.

Var. *striata* (Lea). Pl. 11, fig. 97.

A set of specimens labelled *Liberia* consists of paler shells, greenish-corneous, sufficiently transparent to show the eggs plainly through. They are a little wider, length 16, diam. 4, aperture 3.7 mm., with 9½ whorls. The original description follows.

"Shell somewhat cylindrical, horn-color, thin, longitudinally and beautifully striate; sutures impressed; whorls 8, rather convex. Aperture small, elliptical; columella incurved. This is a beautiful little species, rather larger than the *folliculus* Lam. In form it resembles *Bulimus octoneus* Rang (*Achatina*), but is not quite so large. Its minute and close ribs distinguish it at once, as the *octoneus* is perfectly smooth. The aperture is about one-fourth the length of the shell, and the striæ do not extend below the middle part of the lower whorl. Length .38, diam. .12 inch. [9.5 x 3 mm.] Liberia, Dr. Blanding." (*Lea*).

Achatina striata Lea, Proc. Amer. Philos. Soc. ii, 1841, p. 31; Observations iv, p. 3.

Dr. W. H. Dall, who kindly compared the types with specimens of *striatella*, writes as follows: "I have carefully compared the specimens sent by you with Lea's types of *striata*, and with specimens named *striatella* Rang received from various sources. Your shells to my eye are exactly what we have under the name of *striatella*. Lea's shells are so close to this that I do not think a figure could be made which would enable any one to discriminate them by form or sculpture. There are however the following differences: Lea's shells are all *pale greenish-yellow* like *S. octona*; yours and all our *striatella* are of a *ferruginous brown*. Specimens can be picked out showing identical sculpture and form, but on the whole there is more of a tendency of the sculpture in

striatella to become obsolete or irregular [these specimens are *S. angustior*, H. P.], while in Lea's specimens it is quite uniformly even and regular throughout. I should be disposed to regard the two shells as varieties of the same species."

Var. *petrensis* Morelet.

Slightly less lengthened and a little more ventricose than typical *striatella*, making the shell more conic; also thinner, more transparent, engraved with less pronounced striæ; of a yellowish-fawn tint. Length 16, diam. 5 mm. (*Morel.*).

Freetown, Sierra Leone (Dr. Welwitsch).

There are 9 to 10 whorls, the last less than a third the total length, and obtusely angular. It was originally described as a distinct species, but subsequently united to *striatella* by Morelet. It probably is a distinct as *S. vivipara* and some of the other closely related continental forms.

5. S. CEREA (Pfeiffer). Pl. 11, fig. 88.

Shell oblong-turrited, thin, finely and regularly striate, glossy, pellucid, pale wax-colored. Spire rectilinear, the apex obtuse, suture moderate, minutely crenulate. Whorls 8, slightly convex, the last scarcely more than one-fourth the total length, subangular below the middle. Columella curved, abruptly truncate. Aperture oblique, oblong; peristome simple, unexpanded, the right margin lightly arcuate. Length 14, diam. 4.66, aperture 4 x 2.5 mm. (*Pfr.*).

Fernando Po (Fraser).

Achatina cerea PFR. P. Z. S. 1852, p. 86; Conchyl. Cab. p. 338, pl. 37, f. 5-7; Monogr. iii, p. 501.

This form seems to be a little wider than *S. striatella*. Dr. Boettger reports it from Bibundi, Kamerun, and Gabun (Nachrbl. 1905, p. 178).

6. S. ANGUSTIOR (Dohrn). Pl. 11, figs. 96, 98 to 101.

Shell *turrited-subulate, rather solid,* slightly glossy, waxen, longitudinally closely *striate*, the striæ slightly oblique; apex rather obtuse. Whorls 8 to 9, *nearly flat,* the last one-fifth the length, angular in the middle. Columella arcuate, ob-

liquely truncate. Aperture oval. Length 14, diam. 4, aperture 3.5 x 2 mm. (*Dohrn*).

Prince Island, common on the roots of trees and at the bases of walls, (Dohrn). Cameroons at Bonjongo, (Buchholz), and many other localities, common and generally diffused (d'Ailly).

Stenogyra (*Subulina*) *angustior* DOHRN, Malak. Bl. xiii, 1866, p. 127.—MARTENS, Monatsber. Akad. Wiss. Berlin, 1876, p. 262, pl. 3 f. 14, 15.—*Achatina a.*, PFR., Monogr. vi, 236.—*A. striatella* PFR., Monogr. ii, 263; Conchyl. Cab. p. 341, pl. 37, f. 17, 18; in Philippi, Abbild. ii, p. 216, pl. 1, f. 7.

Subulina a., GIRARD Jornal de Sci. etc. Lisboa, 1893, p. 103. —d'AILLY, Moll. terr. et d'eau douce de Kameroun, Bihang K. Sv. Vet.-Akad. Handl. xxii, p. 111.

"In both *angustior* and *striatella* the columella may be either more or less obliquely truncate, sometimes almost vertical, slight modifications consequently taking place in the shape of the mouth" (*Dohrn*).

Von Martens has figured a specimen from Bonjongo Kamerun, his figures being copied on pl. 11, fig. 101. He notes that the largest specimens are 23 mm. long, 5 wide, the aperture somewhat less than one-fourth the length, whorls 9 to 10, the two upper ones globose and smooth, the striation of the others finer than in *Homorus pileatus*; columellar margin strongly arcuate. The visible part of the third and fourth whorls from the base is almost as high as wide.

The flatness of the whorls is one of the principal distinctive features of the species, but is subject to some variation. In Pfeiffer's figures referred by Dohrn to his species (my pl. 11, figs. 96) they are much less flattened than shown in von Martens' figures of Kamerun specimens.

In Prince Island shells before me the whorls are moderately convex (pl. 11, figs. 98, 99, 100). The striation is weaker and less regular than in *S. striatella*. The specimen figured measures, alt. 14.7, diam. 3.9, aperture 3.7 mm., and has 8½ whorls.

Many shells before me from Senegal and Liberia agree with *angustior* in sculpture but reach a larger size than Dohrn's

types, the length being 17, diam. 4, aperture 3.9 mm., whorls over 9; the whorls are a trifle more convex than in Prince Island specimens. The smooth embryonic shell has subsutural crenulation as in *S. striatella*. The color is a slightly brownish olivaceous yellow.

7. S. VIVIPARA (Sowerby). Pl. 11, figs. 94, 95.

"The shell is commonly about an inch long, consisting of about 9 volutions, the apex being blunt and rounded, the volutions longitudinally striated and the base smooth; the whole nearly white, semitransparent, and covered with a thin olivaceous horny epidermis.

"Three or four fully developed young shells may generally be found upon breaking up a full-grown shell, occupying commonly a great portion of the second, third and fourth volutions from the base. The young ones consist of three volutions before they quit the parent" (*Sowerby*). Locality not given.

Achatina vivipara SOWERBY, The Malacological and Conchological Magazine, part 1, 1838, p. 27.—PFR., Symbolæ iii, p. 91; and in Philippi, Abbild. u. Beschreib. neuer Conchyl. ii, p. 216, pl. 1, f. 5 (specimen received from Sowerby); Monogr. ii, p. 264; Conchyl. Cab. p. 340, pl. 37, f. 15, 16.—REEVE, Conch. Icon. v, pl. 16, f. 70.

Pfeiffer describes a specimen received from Sowerby as follows: "Shell turrited-subulate, rather solid, longitudinally closely rib-striate, rather shining, waxy-whitish. Spire elongate, the apex rather obtuse, whorls 10, convex, the last one-fourth the total length, angulate. Columella slightly arcuate, not reaching the base, obliquely truncate. Aperture semioval, the peristome thin. Length 20, diam. 5.5, aperture 5 x 3 mm." His figures of this shell are copied on my plate.

This species differs from *S. angustior* in the following features: "It is a stronger shell, less slender, and has usually a whorl less in the same length. The rib-striæ are nearly parallel to the axis throughout, and are a little stronger. The whorls are less convex, the last more acutely angular. The aperture is wider, and the columella far more bluntly

truncate. The aperture occupies at least one-fourth the total length of the shell." (*Pfr.*).

Achatina sulcata Gray (pl. 11, fig. 93). "Shell turrited, pellucid, corneous, the apex obtuse; whorls 8 to 9, convex, concentrically sulcate in the middle, at the base smooth; lip thin. Length .7, diam. .2 inch" (*Gray*). Habitat not given.

Achatina sulcata Gray, Annals of Philos., N. Ser., ix, p. 415 (1825). — Reeve, Conch. Icon. v, pl. 17, f. 86. — Pfr., Monogr. ii, p. 267; iii, p. 500; iv, 615; vi, 235.

Reeve's figure of a Cumingian specimen is copied. Pfeiffer in the later volumes of the Monographia considered *A. vivipara* Sowerby a synonym of *sulcata*. The latter name has priority, but is hardly defined with sufficient precision, and the type specimen has not been figured.

8. S. totistriata n. sp. Pl. 13, figs. 17, 18, 19.

Shell thin but strong, imperforate, turrited-subulate, corneous-white, somewhat translucent, glossy; strongly, densely and finely but a little irregularly striate throughout. Whorls 10, convex, separated by a deeply impressed suture, which is irregularly, rather coarsely but not conspicuously crenate in places. Spire regularly tapering to the obtuse apex. The first half whorl is smooth, the next with coarser, more spaced riblets than those on subsequent whorls. The last whorl has a very weak angle at the periphery, often hardly noticeable, were it not that the striæ abruptly become weak there, leaving the base much smoother. Aperture quite oblique, less than one-fourth the length of the shell, ovate; columella concave, obliquely truncate below. Eggs yellowish, spheroidal. Length 16, diam. 3.8, length of aperture 3.75 mm.

Senegambia. Coll. A. N. S. Phila.

This species differs from others of the group by its sculptured embryonic shell, like that of *Pseudoglessula*. In the latter genus the color of the shell is darker, the eggs oblong, and the peripheral angle is generally more emphatic than in this species; but some species such as *P. duseni* and *P. fuscidula* do not exceed the size of *S. totistriata*.

9. S. NORMALIS (Morelet). Pl. 13, figs. 25.

Shell subulate-turrited, with somewhat obtuse apex, thin, diaphanous, glossy, finely and densely striate, corneous. Whorls 9, a little convex, the first smooth, the last indistinctly angular, more than one-third the total length. Columella callous, obliquely truncate, not reaching the base. Aperture semioval, peristome unexpanded, acute and thin. Length 21, diam. 5.5 mm. (*Morel.*).

Toumby, not far from Landana.

Stenogyra normalis MOREL., Journ. de Conchyl. 1885, p. 24, pl. 2, f. 7.

Morelet further notes that the increase is slow and gradual, the whorls moderately convex, suture strongly impressed, the surface glossy, engraved with straight, regular fine striæ except the embryonic whorls which are smooth. The chief difference between this shell and *S. octona* is, aside from the size, in the convexity of the whorls of the spire, much more pronounced in the latter, which in general shape is turrited, while *normalis* is rather subulate.

Specimens received from Morelet resemble rather closely von Martens' figure of *S. angustior*; but the embryonic whorls have a finer subsutural crenulation and the intermediate whorls are more regularly though I think less sharply striate than *S. angustior*.

10. S. GRACILENTA (Morelet). Pl. 13, fig. 20.

Shell turrited-subulate, thin, covered with a corneous-fulvous epidermis, with an oily glass, sculptured with narrow, straight striæ. Whorls 9, slightly convex, the last one-fourth the length of the shell, indistinctly angular around the base. Columella straight, obliquely truncate. Aperture small, semioval, the margins thin and unexpanded. Length 12, diam. 3 mm. (*Morel.*).

Mayumba, north of Landana.

Stenogyra gracilenta MOREL., Journ. de Conchyl. 1885, p. 25, pl. 2, f. 8.

Distinguished by the slim shape and tapering spire, which

is much less obtuse at the summit than in any of its congeners. The whorls increase slowly, and are but slightly convex, though the suture is quite deep. The shell has a horny appearance, covered with a russet epidermis, and shows fine, superficial striæ which tend to become obsolete on the last whorl.

11. S. MEGASPIRA Mabille.

Shell turrited-subulate, imperforate, very glossy, sooty-corneous, very finely striatulate. Whorls 13½, a little convex; separated by a well impressed, simple suture, the last whorl distinctly angular, exceeding one-fifth the length of the shell. Aperture small, ovate; the peristome unexpanded, acute; columella thin, incurved, distinctly truncate. Length 20 to 22 mm., length of aperture 5, width 2.5 mm. (*Mab.*).

Congo region.

Subulina megaspira MAB., Bull. Soc. Philomathique de Paris, (7 ser.) viii, 1884, p. 40.

Differs from *Achatina involuta* Gld. by the number of whorls, the slimmer shape, lighter color not different on the base, etc. It may possibly be a *Homorus,* but the very brilliant gloss and polished surface, on which growth-lines are visible only with the aid of a strong lens, are features more like *Subulina.*

12. S. KASSAIANA Rochebrune & Germain. Pl. 12, fig. 13.

Shell imperforate, very slender, long-cylindric, rather solid, translucent, a little shining, corneous greenish, moderately and regularly striatulate. Spire very long, cylindric, obtuse at the summit, apex obtuse, the embryonic whorl very minute. Whorls 8, convex, slowly increasing, separated by a deep suture, the last whorl convex. Aperture oblique, ovate, buff within; peristome unexpanded, acute; columella short, rather stout, abruptly truncate below. Length 12.5 to 14.5, diam. 3 to 3.5 mm., aperture 3 x 2 or 2.5 mm. (*R. & G.*).

Congo, confluence of the Kassai, 300 meters elevation (Bozas exped.).

Subulina kassaiana R. et G., Bull. Mus. d'Hist. Nat., Paris,

1904, no. 3, p. 142; Mém. Soc. Zool. de France xvii, 1904, p. 16, pl. 1, f. 9.

13. S. LEIA Putzeys. Pl. 13, fig. 24.

Shell imperforate, conic-turrited, thin, glossy, corneous-whitish, obliquely striolate under a lens. Spire long, the apex mamillar, smooth. Whorls 8½, a little convex, the suture impressed, not very deep, irregularly dentieulate. Aperture small, oblique, oval, the lip aeute; eolumella arcuate, tapering-truneate. Length 13, diam. 3.2, aperture 2.7 mm. long. (*Putz.*).

Congo Valley: Nsendwe, Manyema.

Subulina leia PUTZ., Bull. des seances de la Soe. Roy. Malac. de Belgique 1899, p. lvii, fig. 8.

14. S. SUBANGULATA Putzeys. Pl. 13, fig. 23.

Shell imperforate, conic-turrited, thin, glossy, corneous-whitish, the apex obtuse, smooth. Whorls 8, a little convex, the first two smooth, the rest obliquely striolate, the last whorl more dilated, subangular a little below the middle; the suture impressed, not very deep, irregularly dentieulate by the ends of the striæ. Aperture small, oval, oblique, the lip aeute; eolumella areuate, obliquely truneate. Length 12.5, diam. 3.5, aperture 3 mm. long (*Putz.*).

Congo Valley at Nsendwe, Manyema.

Subulina subangulata Putz., t. e. p. lviii, f. 9.

15. S. SEABRAI Nobre. Pl. 24, fig. 42.

Shell turriculate, of 6 regularly rounded whorls ornamented with exeessively fine striæ, visible only under a lens; suture not very deep, ornamented below with a narrow band perfeetly differentiated from the rest of the shell. Columella reeurved; lip simple and aeute. Color vitreous, semi-transparent. Length 5.5, diam. 2 mm. (*Nobre.*).

Angola: Forest of Mupepe, under dry leaves.

Subulina scabrai NOBRE, Molluscas terrestres e fluviæs da exploraeao de Franeiseo Newton em Angola, p. 11, pl. 1, f. 23, 24, in Annaes de Seieneias Naturaes ix, 1905.

In one worn specimen there are milk-white bands parallel to the suture. The generic position of this form is uncertain.

Species of Northeast Africa.

Probably some of the northeast African species placed in *Homorus* might better have been left in *Subulina*.

16. S. SENNAARIENSIS (Pfeiffer). Pl. 14, figs. 54.

Shell oblong-turrited, thin, smooth, pellucid, glossy, buff-corneous; spire with slightly curved outlines, the apex obtuse, suture narrowly margined. Whorls 7½, a little convex, the last nearly one-third the total length, rounded basally; columella arcuate, somewhat calloused, narrowly truncated at the base. Aperture slightly oblique, sinuate-oval; peristome unexpanded, thin. Length 13, diam. 4.33, aperture 4 x 2.33 mm. (*Pfr.*).

N.-E. Africa: Sennaar (Darnaud).

Achatina sennaariensis PFR., Malak. Bl. 1855, p. 169; Novit, Conch. i, p. 104, pl. 29, f. 17, 18; Monogr. iv, 612.—*Subulina s.*, JICKELI, Moll. N.-O. Afr. p. 136.

17. S. CHIARINII Pollonera. Pl. 14, fig. 55.

Shell imperforate, subulate, waxen-glossy, transparent, longitudinally striate under a lens; suture rather oblique, subcrenulate. Whorls 8, nearly flat, the last one-third the total length, tapering at base. Aperture oblique, narrowly oval, acutely angular above, slightly receding basally. Columella arcuate, oblique and shortly truncate. Length 12.5, diam. 3.25 mm. (*Poll.*).

Let-Marefia, near Ankober, in the forest of Fehere-Ghembre (Dr. Ragazzi).

Subulina chiarinii POLL., Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, ii, 1887, no. 34; Bull. Soc. Malac. Ital. xiii, 1888, p. 74, pl. 2, f. 31.

18. S. MABILLIANA Bourguignat. Pl. 14, fig. 56.

Shell imperforate, slender, and long, not much attenuated, fragile, glossy, diaphanous; uniform corneous, frequently

with minute scattered whitish dots; smooth, appearing somewhat striatulate under a very strong lens. Spire long, moderately tapering, the apex obtuse. Whorls 7 to 8, quite convex, regularly increasing, parted by a deep suture; the last whorl oblong-rounded, scarcely one-fourth the total length, slowly descending above. Aperture oblique, oblong; peristome unexpanded, acute. Columella short, slightly arcuate, quite abruptly truncated below; the margins joined by a transparent parietal callus. Length 8 to 9, diam. 2, alt. apert. 2 mm. (*Bgt.*).

Abyssinia: Mt. Abouna Yusef, 4000 meters elevation (Raffray).

S. mabilliana Bgt., Malacologie de l'Abyssinie in Ann. Sci. Nat. (Zool.), xv, 1883, p. 83, pl. 9, f. 68, 69.—Pollonera, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, xiii, no. 313, p. 8 (1898).

Differs from *S. munzingeri* by the less attenuated less acuminate form, uniform corneous color, less numerous and quite convex whorls separated by a deep suture, etc.

A "mutation" *elongatula* Pollonera, is longer, length 12 mm., with the spire more produced. Based on a single shell from Adi-Caie, Erythrea.

19. S. munzingeri (Jickeli). Pl. 14, figs. 52, 53.

Shell imperforate, subulate, thin, glossy, hyaline, whitish, longitudinally striatulate under a lens. Whorls 8, subinflated, separated by a rather deep, oblique suture, the last descending, one-fourth the total length. Aperture oblique, vertically piriform; columella arcuate, very obliquely truncate; lip thin, acute. Length 9.5, diam. 1.75, aperture 2 x 1.33 mm. (*Jick.*).

Beniamer near Weld Jawa, 2814 ft. elevation, on the bank of the Falkat; Nakfa, Habab, at the roots of plants (Jickeli). Mt. Abouna Yousef, 4000 meters elev. (Raffray).

Stenogyra munzingeri Jick., Malak. Bl. 1873, p. 103.—*Acicula m.*, Jick., Fauna der Land- und Susswasser-Mollusken Nord-Ost-Afrikas, in Nova Acta Acad. Cæs. Leop.-Carol. Germaniæ Nat. Cur. vol. 37, p. 133, pl. 2, f. 3 (jaw

and radula), pl. 5, f. 21 (shell).—*Subulina m.*, Bgt., Malac. Abyssinie, p. 82, pl. 9, f. 65-67.

A very slender shell, resembling *S. intermedia* Taylor in this respect.

Species of East and Central Africa.

20. S. elegans Martens. Pl. 14, fig. 35.

Shell conic-turrited, with wide-spaced vertical riblets, glossy, chestnut-brown, with obtuse apex. Whorls 9, the first small, globular, smooth, the second inflated, rather low, with distinct riblets, the third whorl not wider than the second, the rest of the whorls regularly increasing in breadth, weakly convex, with rather deep sutures; last whorl angular at its greatest diameter, rather flattened and only weakly striate beneath. Aperture scarcely oblique, rounded-quadrangular, about one-fourth the total length. Outer lip thin, slightly arcuate; basal margin broadly rounded; columellar margin strongly arcuate, somewhat thickened, white, distinctly truncate below. Length 10, diam. 3, aperture 2.33 x 1.5 mm. (*Marts.*).

Between Ngesi and Mwutan lakes, on the southwestern side of the latter, also south side of Ngesi, various places in Uganda, etc. (Stuhlmann).

Subulina elegans Marts., Nachrbl. 1895, p. 185; Beschalte Weichthiere p. 121, pl. 1, f. 16; pl. 5, f. 17.

From the angle on the last whorl and the rather rapid increase of the whorls in breadth one might think these to be immature specimens of some other species; but it agrees with none of the larger ones collected in the region. The shape of the second whorl reminds one of *Pseudoglessula calabarica*. The intervals between riblets are double the width of the riblets themselves. (*Marts.*)

21. S. lasti (E. A. Smith). Pl. 14, fig. 36.

Shell slender, subulate, polished, olivaceous-brown, here and there streaked with a darker shade; spire narrowed above, mamillate at the apex. Whorls 11, convex, striated with delicate oblique growth lines. Aperture small, acutely oval,

one-fifth the total length. Columella arcuate, truncated in front. Length 15, diam. 3.66, aperture 3 x 1.66 mm. (*Smith*).

Mamboya, 4-5000 ft. elevation (Last); Ituri (Stuhlmann).

Stenogyra (*Subulina*) *lasti* Sm., Ann. Mag. N. H. (6), vi, p. 158, pl. 5, f. 18 (August, 1890).—*S. lasti* Marts., Beschalte Weichthiere, p. 121.

"The two specimens of this species at hand are probably not full-grown, as a faint angulation at the periphery of the body-whorl suggests this opinion. In that case the number of whorls and the proportion of the aperture to the total length may hereafter require modification. *S. involuta* Gould, is similarly colored, but is a larger and thicker shell." (*E. A. Smith*).

The specimens collected by Stuhlmann are a little larger. The dark brown, somewhat streaked coloration is characteristic of this species and *S. elegans*. Perhaps they would be more correctly placed in *Homorus*.

22. S. pinguis Martens. Pl. 14, fig. 37.

Shell club-shaped-turrited, very weakly striate, glossy, pale yellowish. Whorls 9½, somewhat convex, the first comparatively small, rather globose, the second and third of nearly equal size, the following whorls slowly increasing in breath, with rather deep, somewhat crenulate suture; the last whorl scarcely convex above, rounded beneath. Aperture acutely ovate, rather oblique; outer lip thin, unexpanded; basal margin shortly rounded, columellar margin weakly arcuate, some what thickened, whitish. Length 26½, diam. 8, aperture 8 x 4 mm. (*Marts.*)

Migere, Butumbi, in leaf mould. (Dr. Stuhlmann).

Subulina pinguis Marts., Nachrbl. 1895, p. 185; Beschalte Weichthiere p. 121, pl. 5, f. 18.

To be recognized by the comparatively wide contour and glossy-smooth surface; in shape like *Homorus mamboiensis* but decidedly smaller.

23. S. emini (E. A. Smith). Pl. 14, fig. 38.

Shell elongate, slender, pyramidal, subpellucid, pale green-

ish or yellowish-green, polished. Whorls 9, a little convex, slowly increasing, very lightly striate with growth-lines, separated by an oblique, rather deep suture. Apex obtusely rounded. Aperture small, oval, acute above, slightly exceeding one-fifth the total length. Columella quite arcuate, obliquely truncate in front, covered with a thin white callus. Length 16, diam. 3.66, aperture 3.25 x 2 mm. (*Smith*).

Mamboya, 4-5000 ft. elevation (Last).

Stenogyra (*Subulina*) *emini* Sm., Ann. and Mag. N. H. (6) vi, p. 159, pl. 5, f. 19.

"This species bears a general resemblance to *S. stricta* Poey, from Cuba, but differs in having much rounder whorls, a more arcuate columella, with a distinct basal truncation. *S. lasti* is differently colored and has shorter and more numerous whorls. *S. mammillata* Craven is a larger species with a strongly puckered suture." (*E. A. Smith*).

24. S. perstriata Martens. Pl. 14, fig. 39.

Shell turrited, closely covered with vertical rib-striæ, whitish, lusterless, with obtuse apex. Whorls 8½, the first small, rather globular, scarcely projecting, but distinctly striate; the second and third of about equal breadth, the following whorls regularly and slowly increasing in width, somewhat convex, with a moderately deep suture; the last whorl roundly tapering below. Aperture rather oblique, one-fourth the total length, rounded-oval, the outer lip thin, arcuate, the columellar margin rather thin, weakly arcuate, distinctly twisted, very oblique below, and weakly truncate, above passing into a distinct callous deposit on the parietal wall. Length 24½, diam. 6, aperture 5.66 x 3.5 mm. (*Marts.*)

Migere in Butumbi, in forest mould. (*Stuhlmann*).

S. perstriata Marts., Nachrbl. 1895, p. 184; Beschalte Weichthiere p. 122, pl. 5, f. 24.

On first glance similar to the West African *S. striatella* Rang, but well distinguished by the sculpture of the apex; moreover it is larger with fewer whorls, and comparatively less slender. It might be nearest allied to *solidiuscula* and *lenta*, but both of these are notably larger. (*Marts.*).

25. S. BICOLUMELLARIS Martens. Pl. 14, fig. 40.

Turrited, closely rib-striate, dirty brownish, lusterless, with obtuse apex. Whorls 7½, the first rather globular, somewhat projecting, the second globose, smooth, the third still of the same diameter but rib-striate; the following whorls regularly and slowly increasing in diameter, somewhat convex, with moderately deep suture, the last whorl tapering and rounded below. Aperture moderately oblique, three-tenths of the shell's length, long-ovate; outer margin thin, a little arcuate; columellar margin rather vertical, formed of *two spiral cords ascending adjacent to and upon each other, separated by a deep furrow*; below obliquely truncate. Length 15, diam. 5, aperture 4.5 x 2 mm. (*Marts.*)

Karevia, on the western foot of Runssoro, at an elevation of about 1175 meters (Stuhlmann).

S. bicolumellaris MARTS., Nachrbl. 1895, p. 186; Beschalte Weichthiere p. 122, pl. 5, f. 25.

Peculiar in the structure of the columellar margin, which is formed of two adjacent cords. In one example, which served for the illustration, these cords ran parallel and are separated by a furrow; in two others they are somewhat more separated, somewhat diverging, and parted by a small flat surface. Finally, there are from the same place two larger specimens 17.5 mm. long, in which the upper cord is weakly developed but the other scarcely indicated. There seems thus to be a certain measure of variability, and perhaps in old examples a reduction (resorption?) takes place (*Marts.*).

The structure of the columella reminds one of *Digonaxis cingalensis.*

26. S. SUBCRENATA Martens. Pl. 14, fig. 41.

Turrited, very weakly striate, yellowish, with pretty obtuse apex. Whorls 9, the first small, wart-like, the second and third inflated, nearly globular, equal, and smooth; the following whorls regularly, slowly increasing in diameter, scarcely convex, *with irregularly crenate suture*; the last whorl tapering below and rounded. Aperture oblique, three tenths the length, acutely ovate. Outer margin thin, a little

arcuate; basal margin rounded. Columellar margin strongly arcuate, distinctly truncate basally, continued in a thin deposit above upon the parietal wall. Length 13, diam. 3.5, aperture 6 x 2.5 mm. (*Marts.*)

Migere in Butumbi, in leaf mould of the forest (Stuhlmann).

S. subcrenata MARTENS, Nachrbl. 1895, p. 186; Beschalte Weichthiere p. 123, pl. 5, f. 26, 26*a*.

27. S. PERGRACILIS Martens. Pl. 14, fig. 42.

Shell very slenderly turrited, quite weakly striate, yellowish, with rather obtuse apex. Whorls 10, the first small, wartlike, the second and third equal, convex, smooth, the following whorls regularly but very slowly increasing, rather flat with simple, shallow suture; the last whorl tapering below and rounded. Aperture oblique, scarcely one-fourth the shell's length, ovate. Outer lip thin, rather arcuate; basal lip rounded; columellar margin strongly arcuate, obliquely truncate below. Length 13, diam. 3, aperture 2.5 x 1.25 mm. (*Marts.*).

Bukende on the Issango (Dr. Stuhlmann).

S. pergracilis MARTS., Beschalte Weichthiere p. 123, pl. 5, f. 27.

Differs from *S. subcrenata* Martens by the more slender shape and absence of sutural crenation. In general similar to the well-known *S. octona*, but notably more slender. (*Marts.*).

28. S. INTERMEDIA Taylor. Pl. 14, figs. 43, 44.

"Shell elongated, very slender, conic-cylindrical, very thin glossy semi-transparent, of a glossy straw color, very finely striolate in the line of growth; *epidermis* very thin; whorls 8-8½, very oblique, convex, gradually tapering to apex, which is obtuse and abrupt; the last whorl is but little larger than the penultimate; *suture* very oblique, deep; *mouth* broadly ovate; *outer lip* thin and curved; *columella* truncate with a thin and somewhat indistinct layer of callus; *umbilicus* obsolete. Length 0.375, breath 0.076." (*Taylor*).

Length 10, diam. 2.5, aperture 2 x 1 mm. (*Smith*).

Zanzibar (Gibbons); Mamboya (Last); Kingani in Ukami, and Vuami valley, Ussagara (Bgt.).

Subulina intermedia Taylor, Quart. Journ. of Conch. i, p, 282, pl. 3. f. 5.—Marts., Beschalte Weichthiere p. 124.—Bgt., Moll. Afr. Equat. p. 114.—*Stenogyra* (*Subulina*) *i.*, Smith Ann. Mag. N. H. (6), vi, p. 159.

"This is a pale straw-colored glassy shell with rather long whorls, which are minutely (not very distinctly) puckered above at the suture. This feature is not mentioned by Mr. Taylor in the original description (Quart. Journ. Conch. vol. 1. p. 282), nor is it depicted in the figure (pl. 1. fig. 5), in which the aperture is drawn rather too narrow." (*E. A. Smith*).

29. S. conradti Martens. Pl. 14, fig. 45.

Very slenderly turrited, closely, weakly striate, glossy, translucent, pale yellow, with rather blunt apex. Whorls 8, the first globular, the second and third convex, comparatively large, nearly equal in diameter; the following whorls regularly increasing in diameter, only weakly convex, with moderately deep suture. Aperture somewhat oblique, three-tenths the shell's length, between piriform and ovate. Outer margin thin, almost straight, basal margin rounded, columellar margin a little arcuate, somewhat thickened, weakly and obliquely truncate below. Length 12, diam. 2.5, aperture 3.5 x 2 mm. (*Marts.*).

Derema in Ussambara (Conradt).

S. conradti Martens, Beschalte Weichthiere p. 124, pl. 5, f. 28.

It stands between *S. pergracilis* and *intermedia*, but while the upper whorls are more equal, the lower increase more rapidly in diameter than in these two species. In this respect, and the bright gloss, it approaches *S. paucispira* somewhat (*Marts.*).

30. S. chapmani (Melvill & Ponsonby). Pl. 14, fig. 46.

Shell very slender, thin, white, acicular, long-turrited;

whorls 9, a little gradate at the sutures, two at the apex effuse; longitudinally obliquely striate; the last whorl oblong, straight, columella truncate. Aperture oblong-ovate; peristome simple and thin. Length 9.5, diam. 2.25 mm. (*M. & P.*).

Ovampoland (Mr. Chapman).

Stenogyra chapmani M. & P., Ann. and Mag. N. H. (6), ix, p. 90, pl. 6, f. 3 (Jan., 1892).

"An extremely pretty though very small shell, of which the three specimens in Mr. Layard's collection are all more or less imperfect. They bear a decided superficial resemblance to certain marine forms of the genus *Chemnitzia*, the shell being very delicate, white, eight- or nine-whorled, the whorls gradated at the sutures and longitudinally finely ribbed with raised striæ." (*Melv. & Pons.*)

31. S. CHIRADZULENSIS E. A. Smith. Pl. 14, fig. 47.

Shell elongate, imperforate, pale corneous, thin, subpellucid, striated with delicate oblique growth-lines. Spire moderately acuminate, submamillate apically. Whorls 9, slightly convex, bordered by a narrow pellucid line below the suture. Aperture inversely auriform, slightly more than one fourth the total length. Columella arcuate, obliquely truncate in front, the lip simple, thin. Length 18, diam. 5 mm. (*Smith*).

Mt. Chiradzulu, 5000 ft., British Central Africa (*Whyte*).

Subulina c., SMITH, P. Z. S. 1899, p. 588, pl. 33, f. 46.

Allied to *S. subcrenata* Martens. The lines of growth are somewhat strong below the suture, producing a subcrenulated appearance. Prof. E. von Martens (*in litt.*) informs me that it is distinct from all he has described, but comes near his *S. pinguis*, being distinguished by its broader whorls and the different form of the upper part of the spire (*Smith*).

32. S. UNCTA E. A. Smith. Pl. 14, fig. 48.

Shell elongate, thin, pellucid-corneous, polished; whorls 8, rather rapidly increasing, convex, sculptured with oblique, scarcely visible growth-lines, the last whorl elongated. Spire

mamillate at the apex; suture oblique, linear, bordered below with a pellucid line. Aperture inversely auriform, scarcely one-third the total length; lip thin and simple. Columella arcuate, truncate in front, covered with a thin reflexed callus. Length 17, diam. 5.25, aperture 5 x 3 mm. (*Smith*).

Lagari, British East Africa (Steuart Betton).

Subulina uncta Sm., Journ. of Conch. x, p. 318, pl. 4, f. 18 (Apr. 1, 1903).

"It is remarkable for its very smooth glossy surface and form."

33. S. DOHERTYI E. A. Smith. Pl. 14, fig. 49.

Shell lengthened, ovate-fusiform, thin, pellucid, pale corneous, glossy. Whorls 6, rapidly increasing, the upper two smooth, convex, the rest a little convex, parted by a deep oblique suture, regularly sculptured with delicate, oblique, subflexuous striæ, the last whorl lengthened, very obliquely descending. Aperture ovate, acuminate above, the lip very thin. Columella arcuate, shortly truncate in front, covered with a thin callus. Length 9.5, diam. 2.75, aperture 3 x 2 mm. (*Smith*).

Eastern Uganda (Doherty).

Subulina dohertyi Sm., Journ. of Conch. x, p. 319, pl. 4, f. 19. (Apr. 1, 1903).

"The form of this species is rather unusual, and the striæ are distinct and regular."

34. S. VITREA (Mousson). Pl. 14, fig. 50.

Shell minute, imperforate, acuminate-turrited, rather thin, glassy, transparent, striatulate, glossy, pale yellowish. Spire regular, the summit obtuse, suture linear. Whorls 8, slowly increasing, the nuclear whorls rounded, following whorls somewhat flattened, the last whorl one-fifth the total length, oval, more convex beneath, not ascending. Aperture suboblique (making an angle of 30 degrees with the axis), oval. Peristome unexpanded, acute, the margins remote; right margin slightly, basal more arcuate; columella concave, obliquely cut at the base. Length 8, diam. 4 mm. (*Mouss.*).

Southeast Africa: Ku-Ganab, southeast of Ondonga, under stones (Dr. Schintz).

Stenogyra (*Subulina*) *vitrea* Mouss., Journ. de Conchyl. 1887, p. 296, pl. 12, f. 6.—Marts., Archiv f. Naturg. 1897, lxiii, vol. i, p. 40.—*Opeas vitreum* Mouss., Sturany, *t. c.* p. 597.

A small species, almost as clear as glass, with the columella well truncate at the end.

35. S. paucispira Martens. Pl. 14, fig. 51.

Shell elongate, almost turrited, without umbilical fissure, finely striate, the growth-striæ just below the suture somewhat stronger and somewhat curving backward; glossy, pale yellowish, translucent. Whorls 8, the first globose, forming an obtuse apex, the second hardly wider than the first; from the third whorl on it increases regularly in diameter, with a very slightly sunken suture, the last whorl rounded, gradually tapering. Aperture rather oblique, about a third the total length, acutely ovate; outer margin thin, moderately arcuate; basal margin narrowly rounded; columellar margin strongly arcuate, obliquely but very decidedly truncate. Length 25, diam. 7.5, aperture 8 x 4 mm. A slender example measures, length 23, diam. 6.5, aperture 7 x nearly 4 mm. (*Marts.*).

Forest region between Albert Edward and Albert Nyansa lakes; Karevia; Bundeko-Bukendo in Bugundi (Stuhlmann); Eldoma ravine, south of Lake Baringo (Bishop Tucker).

Subulina paucispira Marts., Sitz. Ber. d. Ges. nat Freunde zu Berlin, 1892, p. 177; Beschalte Weichthiere p. 124, pl. 5, f. 23; pl. 1, f. 14.—Smith, Proc. Malac. Soc. Lond. i, 1894, p. 165.

This species has on first sight the appearance of a *Hapalus* (*Curvella*), from its thin, very glossy shell, the comparatively large last whorl and the retraction of the striæ below the suture; but the structure of the columellar margin is wholly that of *Subulina*. Also, the further course of the growth-striæ is not arched forward, and the obtuse apex agrees better with *Subulina*. (*Marts.*)

For this species a section *Nothapalus* has been erected, characterized by the shell resembling *Curvella*, with comparatively large last whorl.

Species of the Comoro Islands.

S. ferriezi is a type of the prevalent form of *Subulina* in the Comoro Is. These shells are very smooth and glossy, with the whorls nearly flat or but weakly convex, and *the embryonic shell with a smooth suture, without crenulate border* (pl. 13, fig. 30). All the species seem to conform to this type except four.

S. cereola no. 42, and *S. canonica* no. 43, are finely striate.

S. avenacea has the short contour of *Opeas,* and a very oblique columellar truncation. It belongs I think to *Opeas.*

S. octona, no. 1, easily recognized by its convex, smoothish whorls and denticulate-bordered suture of the embryonic shell, is found in Madagascar and the Seychelles.

36. S. FERRIEZI ('Marie' Morelet). Pl. 13, figs. 28, 30, 31.

"Shell elongate, turrited, thin, smooth, pellucid, extremely glossy, brownish horn colored. Spire subulate, apex rather obtuse. Whorls 10, a little convex, suture impressed, smoothly united, the last whorl not equal to one-fourth the entire length of the shell. Columella arcuate, obliquely truncate. Aperture oval; peristome thin and unexpanded. Length 18, diam. 5 mm." (*Morelet*).

Comoro Is.: Mayotte I. (Marie).

Stenogyra ferriezi Marie MS., MORELET Jour. de Conch. xxx, p. 187, pl. 10, f. 12 (July, 1882).

This shell, one of the most remarkable of the genus among those which live in the Comoro Islands, approaches, in form and size, the large individuals of *Sten. striatella.* But its aperture is longer, and the shell, of a slightly darker rufous tint, is smooth, glossy and absolutely black when the animal is within. The whorls of the spire are but little convex, and yet plainly separated by a suture bordered by a blackish line which is more or less confluent with it. The suture as it revolves becomes more oblique in the last whorls of the spire."

(*Morelet*). Fig. 28 is a copy of Morelet's; 30 and 31 are drawn from a specimen.

37. S. SIMPLEX (Morelet). Pl. 13, figs. 29, 34.

"Shell imperforate, subulate, thin, very smooth, pale horn-colored, shining, transparent. Whorls 9, planulate, joined by a submarginate suture, the last hardly exceeding one-third the entire length of the shell. Aperture small, piriform, external margin acute, unexpanded, columella arcuate, obliquely truncate. Length 10, diam. 3 mm." (*Morelet.*)

Comoro Islands: Mayotte I. (Marie).

Stenogyra simplex MORELET, Journ. de Conch. xxx, p. 188, pl. 10, fig. 9 (above figure 14); July, 1882.

The features which characterize this shell in a genus where similar forms are so numerous, are in the first place, the polish of its surface, the brevity of its columella, and the slight relief of the whorls of the spire. It has 9 whorls, at first a little convex, then more and more flattened as they approach the aperture. The aperture is small, almost exactly pear-shaped, with the columellar border short, strongly arcuate, and truncated near the base. The shell is transparent, of a pale horn color, smooth, polished, without a trace of striæ, to the naked eye; and hardly distinguished with the aid of a hand lens." (*Morelet*). The short, very concave columella is well shown in fig. 34, representing a shell received from Marie.

38. S. GLABELLA (Morelet). Pl. 13, fig. 21.

"Shell imperforate, pyramidal, thin, diaphanous, shining, smooth, pale yellow. Spire subulate, apex rather acute. Whorls 8, a little convex, slowly increasing, the last obtusely angular at the base, equal to one-third of the length of the shell. Suture narrowly margined, a dark line accompanying it. Aperture oblong, margin thin, unexpanded, columella shortly arcuate, obliquely truncate. Length 13, diam. 5 mm." (*Morelet.*)

Comoro Islands: Mayotte (Marie).

Stenogyra glabella MORELET Journ. de Conch. xxxi, p. 195, pl. 8, f. 11. July, 1883.

"The shell is of a very pale fawn color, is glossy, transparent, smooth to the naked eye, but feebly and irregularly striate under sufficient magnification." (*Morelet*).

39. S. PYRAMIDALIS (Morelet). Pl. 13, fig. 22.

"Shell imperforate, turrited, thin, smooth, polished, translucent, pale horn colored. Spire pyramidal, apex acute. Whorls 9, convex, obsoletely wrinkled below the impressed, brown-margined suture, the last subangulate at the base, scarcely exceeding one-third of the length. Aperture oblong, biangular, external margin thin, unexpanded, columella truncate, shortly canaliculate. Length 15, diam. 5 mm." (*Morelet.*)

Comoro Islands: Mayotte (Marie).

Stenogyra pyramidalis MORELET Journ. de Conch. xxxi, p. 194, pl. 8, f. 9. July, 1883.

Morelet adds that this species is distinguished by its pyramidal, acuminate shape. It is smooth, polished and fragile, of a clear transparent tawny tint. The superficial striæ with which it is engraved are quite numerous on the first whorls of the spire, but lose their regularity on reaching the last, where they may be seen below the sutures indistinctly. It is quite distinct from all others of the same region.

40. S. TEREBELLA (Morelet). Pl. 13, fig. 26.

"Shell acutely turrited, thin, subdiaphanous, smooth, shining, uniform horn colored or obscurely banded; spire pyramidal, apex rather acute. Whorls 9, a little convex, joined by an impressed suture, the last slightly ventricose, over three-sixths the entire length of the shell. Aperture semioval, external margin thin, columella abruptly truncate. Length 17, diam. 6½ mm." (*Morelet*).

Comoro Islands: Grand Comoro (Humblot.)

Stenogyra terebella MORELET Journ. de Conch. xxxiii, p. 290, pl. 14, f. 1. October, 1885.

"The shell is glossy, very superficially striate, of a greyish-horn color, with indistinct, irregularly spaced lines. A variety has in place of this ornamentation, a diffuse brown-

ish zone below the suture. One finds a similar coloration in *Stenogyra nebulosa* from Landana." (*Morelet*).

41. S. ORNATA (Morelet). Pl. 13, fig. 27.

"Shell imperforate, turrited, thin, obsoletely striate, waxen, horny-yellow, purple flamed on the last whorl. Spire subulate, apex somewhat acute. Whorls 8 nearly flat, joined by a slightly margined suture, the last dilated, equaling three-sevenths the entire length of the shell. Columella slightly arcuate, abruptly truncate, touching the base. Aperture semioval, margins thin and unexpanded. Length 14, diam. 5½ mm." (*Morelet*).

Comoro Islands: Grand Comoro (Humblot).

Stenogyra ornata MORELET, Journ. de Conch. xxxv, p. 287, pl. 9, f. 6. October, 1887.

"One might at first be tempted to consider this shell to be a small variety of *Steno. terebella*, which it reproduces almost exactly in shape; but this similarity does not hold good when the details are examined. Without mentioning the size, which is a variable character, one sees that the whorls of the spire are less convex in the new species, and that it is complete in eight instead of nine. They are, moreover, distinctly margined, a particular that does not exist in *S. terebella*, the same with the mode of coloration, which is rare in the genus and maybe considered specific." (*Morelet*).

42. S. CEREOLA (Morelet). Pl. 13, fig. 32.

"Shell elongate turrited, apex obtuse, rather solid, finely hair-striate, shining, pellucid, yellowish white; whorls 8, a little convex, separated by a minutely denticulate suture, the last subangulate below the middle, hardly exceeding one quarter the length of the shell. Columella arcuate, obliquely truncate, not reaching the base of the aperture; aperture oblong; peristome simple, acute and unexpanded. Length 14, diam. 4 mm." (*Morelet.*)

Comoro Islands: Mayotte and Moheli under dead wood near the shore. (M. Vesco).

Achatina cereola MORELET Series Conchyliologiques ii, p. 71, pl. 5, f. 3 (November, 1860).

"The last whorl is modified in shape by an obtuse peripheral angle, sometimes accompanied by a very faint yellowish-green band, which continues to the second half of the last whorl, in the line of sutural development.

"This species is distinguished from *A. octona* by having a shorter more conical spire generally composed of fewer whorls, as well as by the angular form of the last whorl. It is moreover, more distinctly striate." (*Morelet.*)

43. S. CANONICA (Morelet). Pl. 13, fig. 33.

"Shell subulately turrited, apex acute, very finely striate, at the suture plicatulate, shining, horny brown. Spire regular. Whorls 9, planulate, the last hardly equal to one-fourth the entire length of the shell. Columella strongly arcuate, short and obliquely truncate. Aperture semioval, peristome acute, unexpanded. Length 19, diam. 5½ mm." (*Morelet.*)

Comoro Islands: Grand Comoro (Humblot.)

Stenogyra canonica MORELET Journ. de Conch. xxxiii, p. 291, pl. 14, f. 8. October, 1885.

This species, which enlarges very regularly, approaches *S. simpularia* of Anjouan I., but the columella is short, strongly arcuate and obliquely truncate; and after the fourth whorl one sees fine and not very regular striæ, of which some more prominent than the rest, make it plicate below the sutures. (*Morel.*).

Genus OBELISCELLA Jousseaume.

Obeliscella JOUSS., Bull. Soc. Malac. France vi, 1899, p. 359 (*O. lucidissima* the only species mentioned).

Shell *imperforate*, turrited, with obtuse, rounded smooth apex and glossy surface, composed of 9 or 10 nearly flat whorls. Aperture oblique, ovate, the outer lip obtuse, being slightly thickened but not in the least reflexed, straight, not retracted above or below. Columella continuous with basal and parietal margins, slightly concave, rounded, reflexed and closely appressed; parietal callus distinct. Type *O. lucidissima* (Palad.).

Distribution, Southern Arabia and probably East Africa.

The name *Obeliscella* was proposed as a substitute for *Obeliscus* Beck, but it was first used for the species *B. lucidissimus*, which is, in fact, the only species mentioned in Jousseaume's note. Professor von Martens, whose general knowledge of land shells has probably never been surpassed, recognized features which led him to suspect an affinity to *Ennea*. Although we have as yet no anatomical knowledge of the Arabian form, I have little doubt that it will prove to belong with *Ennea, Elma, Streptostele* etc., in the Agnathous family *Streptaxidæ*. The genus is included here merely for temporary convenience, because the shell would naturally be looked for in or near *Opeas*.

O. LUCIDISSIMA (Paladilhe). Pl. 26, figs. 35, 36, 37.

Shell imperforate, elongate-subcylindric, nearly smooth, very glossy, subpellucid, amber or white-hyaline, quite solid. Spire a little attenuated above, the apex obtuse. Whorls 9½, scarcely convex, slowly increasing, separated by a superficial suture which is margined below; the last whorl at the aperture over one-fourth the total length, a little ascending to the aperture; its free margin straight oblique, strongly receding. Aperture oblique, rounded-subpiriform, angled at the insertion of the outer lip; peristome unexpanded, slightly subpatulous; columella rather wide above, reflexed, narrow below; right margin much longer, rather arcuate, the margins joined by a conspicuous callus. Length 15, diam. 4 mm. (*Palad.*)

Arabia: near Aden (Issel); debris of the torrent Kursi near Aden (Jouss.).

Bulimus lucidissimus PALAD., Ann. Mus. Civ. Genova iii, 1872, p. 17, pl. 1, figs. 18, 19.—PFR., Monogr. viii, p. 134.—*Obeliscella lucidissima* Bgt., JOUSSEAUME, Bull. Soc. Mal. France vi, 1889, p. 359.

Readily distinguished by its regularly tapering, obtuse-topped shape, brilliant gloss, the closely appressed columellar callus and blunt, smooth lip. A single specimen before me measures 13.5 mm. long, 3.8 wide, the aperture 3.5 mm. long. It has 9⅓ whorls. The dimensions are therefore between

those given by Paladilhe and by von Martens. The form described by von Martens has been renamed by Jousseaume, without seeing specimens or indicating any differences. While somewhat smaller than the types, there seems to be no adequate reason for giving it a name. The description follows:

Var. *martensi* Jousseaume. Shell cylindric-turrite, lightly striatulate, glossy, reddish-corneous; apex obtuse, subglobose. Whorls 9, flattened, joined by a whitish, moderately impressed suture, regularly increasing, the last shortly tapering at the base. Aperture a little oblique, over one-fourth the total length, subovate, acutely angular above, the peristome unexpanded; a little thickened. Columellar margin rather oblique, basal subangular, above dilated and appressed, passing into a distinct parietal callus. Length 11.5, diam. 3.33, aperture 3 x 2 mm. (*Marts.*).

Ennea ? lucidissima Martens, Naehrbl. D. Malak. Ges. 1889, p. 152.—*Obeliscella ? Martensi* Jouss., Bull. Soc. Malac. France, vii, 1890, p. 99.

Foothills of Badjil and on the Gebel Bura at Chalifa, in the western outliers of the Yemen mountain region (Schweinfurth).

O. bentiæ (Melvill & Ponsonby). Pl. 26, fig. 34.

Shell cylindric, tapering, scarcely pellucid, straight, pale ochraceous; whorls 10, smooth, but slightly ventricose. Aperture ovate, peristome simple, a little thickened. Length 14, width 4 mm. A conspicuous shell, pale ochraceous in color, non-transparent, cylindrical, attenuate, etc., named in honor of the collector, Mrs. Bent (*M. & P.*).

Southern Arabia: Dhofar (Mrs. Bent).

Stenogyra bentiæ M. & P., Proc. Malac. Soc. Lond. ii, p. 1, pl. 1, f. 4 (April, 1896).

The opacity of this shell may perhaps be due to the dead condition of the specimens. In other respects it seems to bear a suspiciously close resemblance to *Obeliscella lucidissima*. I have not seen the species. Melvill and Ponsonby institute no comparisons, and do not seem to have given much attention to the literature of Arabian snails.

O. SUBVARICOSA (v. Martens). Pl. 26, figs. 38, 39.

Imperforate, turrite-lanceolate, with sharp, narrow, vertical striæ, very glossy, yellowish-white with a few pale green-yellowish growth-arrest streaks on all the whorls; rather acute above. 10 whorls, the first small, approaching globular, the second and third swollen, of subequal size, without striæ; the following whorls regularly increasing, somewhat convex, the last but little tapering below. Aperture but slightly oblique, one-third to two-fifths the shell's length, lanceolate; outer margin thin, slightly curved, basal margin narrowly rounded; columellar margin vertical, thick, white, continued on the parietal wall in a very thin deposit. Length 17, diam. 5, aperture scarcely 5 mm. long, 2½ wide (*Martens*).

German East Africa: Runssoro in bamboo forest, 2600 meters elevation; camp no. iii, at 3100 m. elevation (Dr. Stuhlmann).

Opeas subvaricosum MARTS., Beschalte Weichthiere Deutsch Ost-Afrikas, p. 126, 296, pl. 5, f. 29 and 21.

A shorter, somewhat more ventricose form, length 14, diam. 5 mm. (fig. 39), but perhaps not full grown, was taken also at Stuhlmann's Camp III on Runssoro.

The investigation of the radula of a spirit example by Dr. Meissner has shown that this snail belongs to the Agnatha near *Ennea*. It may be referable to the genus *Obeliscella* Jouss., up to this time known only from southern Arabia. (*Marts.*)

O. RETTERI ('Rosen' Kobelt). Pl. 26, figs. 40, 41.

Shell imperforate, long-subcylindric, slowly tapering towards the apex, thin, translucent, very smooth, but seen to be very delicately striate under a strong lens; deep amber-brown. Spire turrite, gradually tapering-conic towards the summit, the sides slightly convex, apex acute, minute, paler. Suture linear, distinct, appressed-marginate below. Whorls 9, a little convex, gradually and regularly increasing, the last slightly larger than the preceding, subcompressed at base, scarcely ascending in front. Aperture small, ovate, compressed above and below, colored within like the outside;

peristome unexpanded, very thin, margins unequal, hardly connected, the outer very thin and fragile, columellar short, slightly arcuate, very delicately filiform-thickened. Length 14, diam. of penult. whorl 4.25, alt. apert. 4 mm. (*Kob.*).

Turkestan: Aulie-ata, in the Syr-Darja district (coll. Rosen).

Stenogyra retteri Rosen mss. KOBELT, Nachrbl. d. Deutschen Malak. Ges. xxxvi, p. 87, June, 1894; and in Rossmässler's Iconographie xii, p. 11, pl. 305, f. 1953.

The first true Stenogyrid from Turkestan. Only one example. It appears adult, but perhaps the peristome is not completely developed (*Kobelt*).

While the generic position of this snail is not certain, yet its characters indicate, I think, a place in *Obeliscella.*

Genus ZOOTECUS Westerlund.

Zootecus WESTERL., Fauna der in der Paläarctischen Region lebenden Binnen-Conchylien, iii, pp. 3, 75, 1887 (for *B. insularis, adenensis, ducoureti, soleilleti*). *Mastus, Bulimus, Rumina* and *Buliminus* in part of authors.—*Chilogymnus* JOUSSEAUME, Bull. Soc. Zool. France, vii, 1894, p. 289 (for *C. insularis* Ehr.).

Shell rather small, pale or white, perforate, *pupiform,* cylindric with conic summit or cylindric-tapering, composed of 7 to 10 *compactly* coiled whorls, the last rounded below; striate or decussate, glossy. *Summit conic,* entire, the *protoconch striate* like the following whorls, not bulbous. Axis slender and straight, narrowly perforated throughout. Aperture small, widely ovate, the *peristome thickened, blunt,* columellar margin straight or concave, with reflexed edge, continuous with the basal lip. *Reproduction viviparous.* Dentition Achatinoid. Type *Z. insularis* (Ehr.).

Distribution: Cape Verde Is. and the Sahara eastward to Arabia, India and Burma, chiefly in arid or barren regions.

A group of small, Pupiform snails, largely eremitic in habits, generally occurring in large numbers, and varying within wide limits in size and degree of taper. Most gatherings from one place show shorter and longer individuals,

as in *Holospira* and *Cerion*; the diameter remaining more constant for any one colony. The proportion of diameter to length is therefore individually variable. There is a good deal of local variation in size and texture, and hence a superabundance of names.

The group was instituted by Westerlund as a section of *Buliminus*. Kobelt, in his great monograph of the "*Buliminidæ*" also leaves *Zootecus* therein, though uncertain as to its position. Bourguignat struck nearer the mark in referring the species to *Rumina*, for I find the dentition to be of the Stenogyroid type. It is however not closely related to *Rumina*, which differs markedly by its smooth, globose protoconch and attenuated, cylindric, subsequent neanic whorls. *Riebeckia* is perhaps the nearest akin to *Zootecus*. *Opeas* and its brood belong to another line of differentiation.

Captain Hutton found the large Indian form (*pullus*) to be viviparous, three or four young shells lying in the oviduct. I have confirmed this by opening dry shells of *Z. insularis*. The young are ovate-conic, perforate, of two or three whorls, and like the adults have the columella entire below.

There seem to be only two well-marked species, but *Z. insularis* has a multitude of local races.

1. Z. CONTIGUUS (Reeve). Pl. 26, figs. 19, 20.

Shell elongately cylindrical, not umbilicated, whorls 9, flatly convex, smooth, polished, faintly impressed-crenulate at the sutures; columella broad, vertical. Aperture minute, margins thickened, reflected, joined above by a callosity. Ivory-white. (*Reeve*). Length 12 mm.

Island of Sokotra (Reeve); Abd-el-Kuri, under stones on the peak Gebel Saleh, 800-1500 ft. elevation (H. O. Forbes).

Bulimus contiguus RVE., Conch. Icon. v. pl. 79, f. 582 (Sept., 1849).—*Buliminus* (*Mastus*) *contiguus* (Rve.) SMITH, Natural History of Sokotra and Abd-el-Kuri, p. 152; 1903.—*Bulimus teres* PFR., Zeitschr. f. Malak. 1849, p. 90 (Nov., 1849).—*B. contiguus* Rve., PFR., Conchyl. Cab. p. 253, pl. 68, f. 14, 15: Monogr. iii, 403 (description of *teres* repeated under the name *contiguus*).

While closely related to *Z. insularis*, this insular form differs by its very glossy and smooth surface without the characteristic decussation of that species except on the earliest whorls. The striation is weak except just below the sutures. The lip and parietal wall are more heavily calloused than usual in *insularis*, and the aperture is smaller. Reeve's figure represents a shell in which the dried animal shows darkly through the shell. The specimen drawn in fig. 119 measures, length 12, diam. above aperture 3.7, length of aperture with peristome 3.3 mm.; whorls 9.

Z. contiguus has been erroneously reported from Zanzibar. Its presence on the island of Sokotra has not been confirmed by the recent explorations there of several naturalists, but it was found on the neighboring islet of Abd-el-Kuri.

Bulimus teres (fig. 20). Shell subimperforate, rather solid, cylindric, very finely (especially at the sutures) striatulate, glossy, fleshy-whitish. Spire tapering above, apex obtusely conic, suture impressed, submarginate. Whorls 9, a little convex, the last about two-sevenths the length, subascending in front. Aperture vertical, subpiriform; peristome lipped and somewhat thickened, margins joined by a callus, the right margin straight, subdilated in the middle, columellar margin vertical, short, reflexed. Length 13, diam. 4, oblique alt. apert. 4, width 3 mm. (*Pfr.*).

2. Z. INSULARIS (Ehrenberg). Pl. 26, fig. 21, and vars. figs. 22-33.

"Subcylindric, apex tapering, subacute, glossy, whitish-corneous, very finely transversely striate, the striæ narrower towards the apex, pellucid, aperture semiovate, the margin a little reflexed, lightly calloused, whorls 7 to 8, the three first subequal in diameter.

"Length 5½, width 1¾ lines, whorls 8.

"Length 5¼, width 1¾ lines, whorls 7." (*Ehrenberg*).

Cameran Island, in the Red Sea (Ehrenberg). The various forms of the species extend from the Cape Verde Is. and Senegambia eastward to Egypt, Abyssinia, southern Arabia, Beluchistan, Hindustan and Ceylon, and as far east as Upper Burma.

Pupa insularis Ehrenberg, Symbolæ Physicæ, Animalia Evertebrata, Ser. I, Mollusca, fourth signature, page third. 1831.—Pfr., Monogr. ii, p. 307.—*Bulimus insularis* Pfr., Monogr. Hel. Viv. iii, p. 403; iv, 463; Conchyl. Cab. p. 125, pl. 36, f. 26-28.—Reeve, C. Icon. v, pl. 67, f. 476.—Morelet, Ann. Mus. Civ. Genov. iii, 1872, p. 198 (Dahalac and Raṣ Gherar Is.).—Hanley & Theob., Conch. Ind. p. 11, pl. 22, f. 10 (Delhi, Bundelkund, etc.).—Bgt., Mal. de l'Abyssinie, Ann. Sci. Nat. Zool. xv, 1883, p. 65 (includes *Pupa pulla* Gray, *P. cylindrica* Hutt., *B. contiguus* Rve. and *adenensis* Pfr. as synonyms).—*Rumina insularis* Bgt., Moll. Choa. p. 22, 1885.—Jousseaume, Bull. Soc. Malac. France vi, 1889, p. 359 (includes *B. adenensis* Pfr., *ducoureti* and *soleilleti* Bgt. as synonym; vii, 89.—Buliminus insularis Ehr., Jickeli, Moll. N.-O. Afrikas p. 108, pl. 5, f. 4.—Pollonera, Bull. Soc. Malac. Ital. xiii, p. 70 (Havash valley); Boll. Mus. Zool. ed. Anat. Comp. Univ. Torino xiii, no. 313, p. 6 (Massaua, Assab).—Smith, Proc. Malac. Soc. Lond. i, p. 142 (Oman, Arabia).—Martens, Nachrbl. D. Malac. Ges. 1889, p. 151 (Badjil and Chalifa on the Gebel Bura).—*Chilogymnus insularis* Jousseaume, Bull. Soc. Zool. France vii, 1894, p. 289 (Ceylon).—*Cylindrus insularis* Ehr., Theob., Journ. Asiat. Soc. Beng. xlvii, pt. 2, 1878, p. 146 (Kashmir).—*Pupa* (*Cylindrus*) *insularis* Ehr., G. Nevill, in Anat. and Zool. researches and Zool. Results of the Yunnan Expeditions, i, p. 882, 1878 (includes *pullus* Gray and *cylindrica Hutt.*).—"*Pupa . . . (mihi) cylindrical?*," Hutton, Journ. Asiat. Soc. Bengal iii, p. 93, 1834 (no. 6, genus Pupa, p. 85); quoted as "*Pupa cylindrica* Hutt." by authors.—*Bulimus cylindricus* auct.

The sculpture consists of fine, close, subvertical striæ, a little bent near the suture, and intersected by several (usually three to six) very narrow smooth spiral bands. These may be obsolete on the last whorl or two, though usually persistent. The whorls are moderately convex, the last ascending a trifle to the aperture. The outer lip is somewhat thickened inside, giving the appearance of a low white welt behind it externally. The edge itself is obtuse but not ex-

panded. The columellar margin is dilated, thickened, and arches over the very small umbilicus.

The species is excessively variable, but the typical form is small, specimens measuring as follows:

Length 10, diam. above aperture 3.8 mm., whorls 8⅓.

Length 9, diam. above aperture 3.3 mm., whorls 7½.

Length 8, diam. above aperture 3.2 mm., whorls 7¼.

This small form is common in Arabia and India. The shell is thinner and usually more whitish-corneous, less opaque-white than the larger forms.

Shells of the same general type but more robust have been found in both Africa and India, and numerous nominal species have been based upon them. It is quite likely that some of these may be found to be local races worthy of recognition by name; but pending a thorough study of the subject by some naturalist with the requisite local knowledge, it seems best to give in this place merely the original documents, with such notes on the shells and figures as may seem useful.

African forms.

In Eastern Africa *Z. insularis* has been reported from Egypt (Letourneaux); around Massaua, in the Bogos country and on the Hamacen plateau, Abyssinia (Raffray); western shore of Lake Stephanie, British East Africa (Dr. A. Donaldson Smith, 1896). Much further west it has been found at Oued-Aflissat, north of Insala, in the Algerian Sahara, a place in about 27° N. Lat., nearly south from Algiers (Soleillet, *B. soleilleti* Bgt.). Still further west it occurs in Senegambia (coll. A. N. S. P.) and on the Cape Verde Islands, where it is known as *B. subdiaphanus* King.

The specimens collected by Dr. A. D. Smith at Lake Stephanie are quite cylindric, sharply finely striate, with the characteristic decussating spiral grooves (pl. 26, fig. 22). They measure from 10 x 4.2 to 11 x 4 mm., whorls 7½ to 8. The parietal callus is not very thick.

Bourguignat's specimens from the Algerian Sahara described as *B. soleilleti* (Species noviss. Moll. in Eur. Syst.

detectæ, p. 21, 1876) are larger, 13 x 4 mm., with 8½ whorls and a strong parietal callus, being similar to var. *pullus*.

Some specimens from Senegambia before me are quite like typical *Z. insularis* except in being in the average a little more cylindrical, 10 x 3.8 mm., some of them with the spiral grooves obsolete.

Var., *subdiaphanus* (King). Pl. 26, fig. 33. Shell minutely perforate, conic at the summit, the last 3 or 4 whorls subcylindric, but slightly tapering, bluish-white under a very thin yellow or brownish cuticle. Sculpture of fine, often nearly effaced striæ, strongest below the suture, and which in some specimens are interrupted by shallow spiral grooves. Whorls 7½ to 8½, slightly convex, the last a little thickened behind the lip. Aperture small, widely ovate, the peristome quite obtuse; columellar margin dilated and expanded. Parietal callus usually rather thick.

Length 16.7, diam. above aperture 5.5 mm.

Length 12, diam. above aperture 4.2 mm.

Length 12, diam. above aperture 3.8 mm.

Length 9.8, diam. above aperture 3.4 mm.

Cape Verde Islands: Porto Praya (King, type loc.); S. Nicolao, S. Iago, Fogo and Brava under stones, especially in barren places near the sea (Wollaston); S. Vicente, S. Antao, Branco (Fischer).

Pupa subdiaphana King, Zoölogical Journal v, p. 340 (last half of 1831).—*Bulimus subdiaphanus* King, Pfr., Symbolæ ii, p. 122; Monogr. ii, 163; iii, 404; iv, 464; vi, 102; viii, 140; Conchyl. Cab. p. 53, pl. 16, f. 7, 8.—Reeve, Conch. Icon. v, pl. 69, f. 493.—Morelet, Journ. de Conch. 1873, p. 238.—*Buliminus s.*, Dohrn, Malak. Bl. 1869, p. 11.—Fischer, Journ. de Conch. 1884, p. 380.—*Stenogyra subdiaphana* Wollaston, Testacea Atlantica p. 511 (1878).—*Helix bamboucha* Fer., Rang, Bull. univ. des Sci. i, 1827, p. 306 (no description).—*Bulimus bamboucha* Webb et Berth., Ann. Sci. Nat. xxxviii, p. 325.—*Bulimus baboucha* Potiez et Michaud, Catal. Moll. Galerie du Douai i, p. 134, pl. 14, f. 5, 6. (1838).

The Cape Verde Island specimens are so similar to some

forms of *insularis* that without the locality they could not, I think, be distinguished. A form of *insularis* is known from the adjacent African mainland (Senegambia), as well as from points in the Sahara; and it will probably be found to extend across the continent in the arid zone.

Cape Verde I. specimens vary a good deal, doubtless locally. Some specimens 10 mm. long have as many whorls as others of nearly 17 mm. length. Captain King gives the length of the type as a little less than four-eighths of an inch.

Asiatic forms.

Z. insularis is generally distributed in southern Arabia. Jousseaume gives the localities: Mascat; near Aden; Dyobla, between Aden and Sana Mahala, between Aden and Steamer Point, to which we may add Djobla, north of Aden, the locality of *Bulimus ducoureti* Bgt. (Species noviss. Moll in Eur. Syst. detectæ, p. 20, 1876). Nevill states that in the Indian Museum there are specimens from Sind, Kutch, Suliman Range, Trichinopoly, Ceylon, Poona, Burwani Hills, Tinali (Benares), Saharunpur (N.-W. Provinces), Pagan, Upper Burma, etc. It is not found around Calcutta. These localities doubtless pertain to several forms of the species, not to typical *insularis* alone. Ancey has given a review of the Asiatic forms in Bull. Soc. Malac. France iii, 1886, pp. 60-64. While typical *insularis* is common in India, the prevalent type is

Var. PULLUS Gray (pl. 26, figs. 26-28) a larger, opaque, whitish shell, more or less tinted with reddish-brown on the spire, and measuring as follows:

Length 15, diam. above aperture 5 mm.; whorls 9.
Length 13, diam. above aperture 4.9 mm.; whorls 8⅓.
Length 10, diam. above aperture 4.3 mm.; whorls 7½.
Length 9.7, diam. above aperture 4.5 mm.; whorls 7⅓.
Length 8, diam. above aperture 3.8 mm.; whorls 6½.

The Arabian *adenensis* Pfr. and *ducoureti* Bgt. are scarcely separable from *pullus* Gray.

"*Bulimus pullus.* Shell ovate, subcylindric, subimperfor-

ate, pellucid, whitish, delicately striate, apex conic, rather obtuse, pellucid. Whorls 9 or 10, scarcely raised. Aperture small, subrotund, semilunate; lips somewhat thickened, rounded. Length 8, diam. 2½ lines. Eastern India on the banks of the Ganges, Dr. Royle. It varies greatly in size and is often smaller'' (*Gray*).

Bulimus pullus Gray, P. Z. S. 1834, p. 66.—Pfr., Monogr. iv, p. 463; vi, p. 101.—*Rumina pulla* Gray, Ancey, Bull. Soc. Mal. France iii, p. 61 (distribution).

Bulimus adenensis Pfr., (pl. 26, fig. 30). Shell subperforate, subcylindric, solid, smoothish, glossy; white, irregularly strewn with grayish corneous spots. Spire long, tapering above, the apex conic, rather acute, hyaline. Suture light. Whorls 9, scarcely convex, the last about two-sevenths the total length, subascending in front, rounded below. Aperture vertical, subrhombic-semioval; peristome unexpanded, the margins joined by a thick callus, right margin obtuse, columellar margin thick, dilated. Length 13, diam. 4.25, aperture scarcely 4 mm. long, 2 wide (*Pfr.*).

Arabia: on volcanic rocks at Aden (Benson, type loc.), and on the island Dakulak in the Red Sea (Rüppel).

Bulimus adenensis Pfr., Zeitschr. f. Malak. 1851, p. 27; Conchyl. Cab. p. 78, pl. 21, f. 12, 13; Monographia iii, p. 404. —*Pupa edentula* Ruppel mss. in Cuming Coll.

Var. agrensis Kurr (pl. 26, figs. 24, 25) comprises stouter, white and chalky forms. *B. chion* Pfr. (pl. 26, fig. 32) is only a small form; while *estellus* Bens. (pl. 26, fig. 29) differs in being still more robust. The figured specimen of *chion* (fig. 32) measures length 12, diam. 5.2 mm., whorls 7½.

B. agrensis Kurr. (Pl. 26, figs. 24, 25). Shell perforate, cylindric-turrite, smooth, glossy, white; spire long, gradually tapering above, the apex rather acute, suture impressed. Whorls 9, a little convex, striate at the sutures, the last not one-third the total length, somewhat ascending in front, rounded basally. Aperture vertical, rounded-lunar; peristome simple, unexpanded, the right margin lightly arcuate,

columellar margin subvertical, narrowly reflexed, overhanging. Length 16, diam. 6, aperture 5 x 3⅓ mm. (*Kurr*).

Agra (Munich Museum).

Bulimus agrensis Kurr, Malak. Bl. ii, 1855, p. 107.—Pfr., Novit. Conch. i, p. 57, pl. 16, f. 9, 10; Monogr. iv, p. 463.—Hanley & Theobald, Conch. Indica pl. 23, f. 1.

I have not seen this form, which seems to differ from *insularis* by the smooth surface; yet I think it should probably be ranked as a subspecies of the wide-spread *insularis*. Hanley figures a more tapering form than the type figured by Pfeiffer.

B. chion Pfr. (Pl. 26, fig. 32). Shell perforate, oblong, solid, striatulate, white. Spire long, terminating in a somewhat acute cone. Whorls 7 to 8, moderately convex, the last a little more than one-third the total length, somewhat ascending in front, the base rounded. Aperture vertical, ovate-lunar; peristome calloused, the margins joined by a callus, columellar margin short, somewhat straightened, dilated. Length 12, diam. 5.5, oblique alt. of aperture 4.33, width 3 mm. (*Pfr.*).

Mouth of the Indus river and in the Punjaub (Shiplay), in Cuming Coll.).

Bulimus chion Pfr., P. Z. S. 1856, p. 332; Monogr. iv, p. 463.—Hanley & Theob., Conch. Indica p. 11, pl. 22, f. 1.—*Rumina chion* Pfr., Ancey, Bull. Soc. Malac. France iii, 1883, p. 60.

Bulimus estellus Benson. (Pl. 26, fig. 29). Shell narrowly perforate, oblong, cylindric, rather remotely grooved spirally, the intervals between grooves being very closely rib-striate; whitish; spire cylindric, the apex conic, rather acute; suture impressed; whorls 8, slightly convex, the last ascending in front, about one-third the length of the shell, the base slightly compressed around the perforation. Aperture vertical, angulate-oval; peristome obtuse, the columellar margin vertical, thickened and reflexed. Length 18, diam. 6 mm. (*Bens.*).

India: in the district of Sind (Col. W. E. Baker).

B. estellus Bens., Ann. and Mag. N. H. (2), xix, April,

1857, p. 327.—Pfr., Monogr. iv, 462.—Hanley & Theob., Conch. Indica, pl. 22, f. 4.

"At once distinguished from the allied *B. pullus* Gray by its stouter form and by the ascent of the last whorl near the aperture" (*Bens.*).

Var. POLYGYRATUS Reeve. (Pl. 26, figs. 31). "Shell pyramidally turrited, minutely umbilicated, whorls 9 to 10, rather narrow, rounded, finely plicately striated, columella reflected, aperture small, lip simple; bluish-white. An erect, closely convoluted shell, of which the sutures are rather impressed" (*Reeve*).

The habitat of the type was unknown. Nevill refers here specimens from Gwádar, Beluchistan; Aden; Bender Abbas, Persia; and Rohra Hills, Sind.

Bulimus polygyratus Reeve, Conch. Icon. v, pl. 79, f. 578 (1849. — Pfr., Monogr. iii, p. 404. — *Pupa insularis* var. *polygyrata* Rve., Nevill, Handlist Ind. Mus. i, p. 195.— *Bulimus polygiratus* Reeve, Issel, Mem. Real Accademia della Scienze di Torino (2 ser.), xxiii, p. 416, pl. 2, f. 25-28, 1866 (Bender Abbas).

This is a comparatively narrow, cylindric form. According to Nevill, *B. pertica* Bens. is an aberrant specimen of *polygyratus*. The description follows.

B. pertica Benson. (Pl. 26, fig. 23). Shell imperforate, exactly cylindric, very much lengthened, very closely arcuate-striolate, and sculptured with some inconspicuous spiral grooves. White. Spire cylindric with conic, rather obtuse apex; suture impressed. Whorls 10, nearly flat, the last one-fifth the length of the shell, slightly descending in front, rounded basally. Aperture very oblique, piriform; peristome thin, the basal margin thickened, subeffuse, columellar margin expanded, appressed. Length 20, diam. 5 mm. (*Bens.*).

India: in the region of Sind (Col. W. E. Baker).

Bulimus pertica Bens., Ann. and Mag. N. H. (2), xix, April, 1857, p. 328.—Pfr., Monogr. iv, p. 462 —Hanley & Theob., Conch. Indica, pl. 22, f. 7.

"At once distinguishable from *B. pullus* Gray and its allies by its lengthened, cylindrical form, its slenderness, and by the obliquity of the aperture" (*Bens.*).

Genus PSEUDOPEAS Putzeys, 1899.

Pseudopeas Putz., Annales de la Société Royale Malaeologique de Belgique, xxxiv, 1889, Bull. des séanees p. lviii.—*Beccaria* Bourguignat, Malae. Abyssinie, in Annales des Seienees Naturelles, Zoologie, xv, 1883, p. 119 (for *S. isscli* Jick). Not *Beccaria* Trinchese, Ann. Mus. Civ. di Stor. Nat. di Genova, i, 1870, p. 47 (Nudibranehiata).

Shell imperforate or perforate, similar to *Opeas* but with the *protoconch of about 2 whorls spirally striate*, subsequent whorls longitudinally ribbed or rib-striate. Aperture as in *Opeas,* the eolumellar margin reflexed. Type *P. pulchellum* Putz.

Distribution: tropieal West Afriea; Abyssinia; Comoro Is.; Central Australia; South Ameriea.

This is one of the most distinct of the groups dismembered from *Opeas*, though its speeial features ean scarcely be seen without a compound mieroseope. It was first recognized by Bourguignat, who knew it only from Jiekeli's aeeount; but the generie name given by him had been used many years before. Dr. Putzeys in 1899 proposed *Pseudopeas* as a new subgenus for ribbed *Opeas*, without knowing of Bourguignat's work, and in the belief that the protoconeh was smooth. Only Jickeli and d'Ailly have noticed the apical seulpture.

That the West and East African speeies are closely related there ean be no reasonable doubt; but the Australian form referred to the genus may prove to be an unrelated but eonvergent braneh from the *Opeas* stem. The same may be true of the Ameriean speeies.

Subgenus Pseudopeas *s. str.* Shell short, of 5 to 7½ more or less ribbed whorls; protoeoneh very minutely engraved spirally. Reprodueing by large globular eggs, as in *Opeas.*

Prinee Island, Gulf of Guinea: *P. crossci.*

West Africa and Congo Valley: *P. saxatile, plebeium, egens, pulchellum, scalariforme.*

Abyssinia: *P. isseli.*

Comoro Is.: *P. pusillum.*

Subgenus EREMOPEAS Pils., *nov.* Shell long, of 7 to 9 whorls, densely and evenly striate; protoconch sculptured with rather coarse, low, weakly nodose spirals. Viviparous, bringing forth young of an oblong shape with about 2½ whorls. Type *P. interioris* (Tate), Central Australia.

N. E. Australia: *P. tuckeri.*

1. P. CROSSEI (Girard). Pl. 15, figs. 60, 61.

Shell conic-turriculate, subperforate, thin, transparent, somewhat shining, yellowish, ornamented with small, slightly curved riblets, quite separated and regularly spaced. Spire composed of 6 very convex whorls of regular increase, parted by a deep suture; the embryonic 1½ whorls smooth, summit obtuse. Last whorl rounded, slightly less than one-third the total length. Aperture oval-rounded, slightly oblique; peristome simple, acute, the margins joined by a very weak callus; columellar margin straight, reflexed, forming a very indistinct angle with the basal margin; outer margin noticeably arched forward. Length 4.5, diam. 2, aperture 1.5 x .8 mm. (*Girard*).

Prince Island, O que S. Joao at an elevation of 200 meters, (F. Newton).

Opeas crossei GIRARD, Jornal Sci. Math. Phys. e Nat. Acad. Real Sci. Lisboa iii, 1893, p. 105, pl. 1, f. 13.

Differs from *Opeas pauper* in shape and ornamentation. The small number of whorls, deep sutures and ornamentation cause me to refer this species to *Pseudopeas*, in the belief that Girard overlooked the extremely minute sculpture of the protoconch.

2. P. SAXATILE (Morelet). Pl. 25, figs. 1, 2, 3, 4.

"Shell perforate, turrited, finely costulate-striate, opaque, a little shining, covered with a brownish-green epidermis. Whorls 7, a trifle convex, the last slightly exceeding one-third

of the entire length of the shell; columella slightly receding. Aperture oblong-oval. Peristome simple, thin, columellar margin dilated. Length 7 to 9, diam. 2 to 2.5 mm." (*Morelet*).

West Africa: near Landana.

Stenogyra saxatilis MORELET Journ. de Conch. Jan., 1885, p. 27, pl. 2, f. 1.

"This little shell, together with the following, belongs to the group *Opeas* characterized by an umbilical perforation and by a weak reflection of the columellar border. The species is formed of 7½ moderately convex whorls, united by a quite deep suture; the last whorl, relatively longer than the others, is plainly perforated. The somewhat oblique columellar border is weakly dilated throughout its extent, but particularly at its point of insertion, where it is reflected over the umbilical perforation. The shell, of a greenish-brown, deeper at the base, is opaque, slightly shining, covered with a fine and irregular costulation, less pronounced on the last whorl of the shell" (*Morelet*).

A small specimen received from Morelet, 6 mm. long with 6 whorls, is figured. The color and epidermis mentioned by Morelet, are less obvious than he would lead us to expect. Three large eggs show through the penult. whorl. The first 1½ whorls appear smooth, but under the compound microscope they are seen to be densely and very beautifully engraved spirally.

3. P. PLEBEIUM (Morelet). Pl. 25, figs. 5, 6, 7, 8.

"Shell narrowly perforate, ovately oblong, apex acute, thin, opaque, slightly shining, under the lens arcuately striolate, brownish-green. Whorls 6, a little convex, the first three smooth, the last enlarged, equal to three-sevenths of the entire length of the shell. Aperture oblong, with simple margins, columella straight, narrowly dilated, reflexed. Length 5 to 7, diam. 2.5 to 3 mm." (*Morelet*).

West Africa: near Landana.

Stenogyra plebeia MORELET Journ. de Conch. 1885, Jan., p. 27, pl. 2, f. 2.

The shell, of the same nature and color as *saxatilis*, is also

ornamented with a fine and superficial costulation intermingled with simple striæ; but it has a whorl and a half less, the last, by its development, approaches more to a bulimoid form. These differences, which seem sufficient to justify a separation, are accompanied by other modifications of detail; the columella is less dilated, the aperture is larger and the points of insertion of the peristome are much more remote. This last character is very apparent." (*Morelet*).

A specimen not quite full grown, of 5 whorls, is figured. The apical whorl is very finely and densely engraved spirally, though this sculpture is visible only under the compound microscope.

4. P. EGENS (d'Ailly).

Shell minutely perforated, turrited, densely arcuately plicate-striate, pale corneous, thin, diaphanous, with a waxen luster. Spire turrite, the apex rather obtuse. Whorls 6, the embryonic ones a little convex, seen under a lens to be very minutely and densely striate spirally; the following whorls flattened, more or less terraced, regularly increasing, separated by an impressed suture, under the lens seen to be delicately crenulate and indistinctly margined; last whorl two-fifths the length, angular or terraced at the suture and compressed around the perforation. Aperture oblong, vertical, peristome simple, the margins joined by a very delicate callus, the right margin arching forward, unexpanded, columellar margin with a long reflection; columella subvertical, generally bending a little towards the left. Length 5 to 6, diam. 1.5 to 2 mm. (*d'Ailly*).

Kamerun: Kitta (Sjostedt).

Opeas egens d'AILLY, Moll. terr. et d'eau douce de Kaméroun, in Bihang till K. Sv. Vet.-Akad. Handl., xxii, p. 113 (1896).

The spiral sculpture of the protoconch "is of extreme fineness, and may be seen distinctly only under a strong lens in a favorable light. Almost all of our examples contain perfectly spherical eggs arranged in a single series in the oviduct, visible by transparence through the shell."

This species differs from the others by its flattened whorls, terraced at the sutures.

5. P. PULCHELLUM Putzeys. Pl. 25, fig. 13.

"Shell imperforate, ovate-turrite, thin, yellow, diaphanous, with obtuse submamillate apex. Whorls 5½, convex, the first two smooth, the rest ornamented with raised, sublamellose, slightly oblique ribs, and parted by a deep suture, the last whorl a little swollen. Aperture oval; columella straight, reflexed, nearly reaching the base, and forming an angle with the lip anteriorly; margins joined posteriorly by a very thin callus. Length 3.5, diam. 1.6, length of aperture 1.33 mm." (*Putz.*).

Congo Valley: Nseudwé, Manyéma.

Pseudopeas pulchellum PUTZ., Ann. Soc. Roy. Malac. Belgique xxxiv, 1899, Bull. des séances p. lix, fig. 11.

Although Dr. Putzeys states that the first two whorls are smooth in this species and the next, I do not doubt that when seen under a high power they will be found to be spirally engraved.

6. P. SCALARIFORME Putzeys. Pl. 25, figs. 9, 10.

"Shell imperforate, turriculate, elongate, thin, yellowish, the apex obtuse. Whorls 6½, convex, quite regularly increasing and joined by a deep suture, the first two whorls smooth, the rest ornamented with many longitudinal lamellar riblets. Aperture oval, the lip acute; columella twisted, subplicate, columellar margin reflexed, continuous with the anterior lip-margin. Length 4.5, diam. 1.7, length of aperture 1.5 mm." (*Putz.*).

Congo Valley: Nseudwé, Manyéma.

Pseudopeas scalariforme PUTZ., *t. c.*, p. lix, f. 12, 13.

7. P. ISSELI (Jickeli). Pl. 25, fig. 11, 12.

Shell oblong-ovate, thin, rather glossy, whitish, glassy-diaphanous, under the lens seen to be strongly ribbed lengthwise, the upper whorls ornamented with spiral striæ. Spire long-conic, the apex obtuse. Whorls scarcely 5, inflated,

separated by a deep and somewhat oblique suture, the last whorl long, nearly half the total length. Aperture vertical, oblong, acuminate above; peristome thin, simple and acute; columellar margin straight, a little reflexed and thickened. Length 2.75, diam. 1.5, aperture 1.5 x 1 mm. (*Jick.*).

Abyssinia: Bogu Valley, Bogos (Beccari).

Subulina isseli Jick., Fauna der Land- und Süsswasser-Mollusken Nord-Ost-Afrikas, in Nova Acta K. Leop-Carol. Deutschen Akad. der Naturforscher, xxxvii, 1874, p. 138, pl. 5, f. 22.—*Beccaria isseli* Bgt., Malac. Abyss., in Ann. Sci. Nat. xv, 1883, p. 119.

Described from a single specimen thought by Jickeli to be not full grown.

8. P. pusillum (Morelet). Pl. 25, figs. 14, 15, 16.

"Shell very small, rimate, turrited, rather thin, whitish horn-color, shining, minutely costulate, apex somewhat obtuse. Whorls 5½, plano-convex, joined by a moderately impressed suture, a little terraced, the last nearly equal to one-third of the entire length of the shell. Aperture oval; peristome simple, acute, columellar margin descending vertically, shortly reflexed as far as the base. Length 3, diam 1½ mm." (*Morelet*).

Comoro Islands: Mayotte (*Marie*).

Stenogyra pusilla Morelet, Journ. de Conch. July, 1881, p. 220, pl. 10, f. 4. Not *Achatina pusilla* Pfr., nor *Bulimulus* (*Ena*) *pusilla* Ad.

"This shell, of which I have two fully adult specimens before me, is doubtless the smallest species of the genus. Its minute size is sufficient, in the absence of all description, to make it recognizable. The five whorls of which the spire is composed are plainly separated and even a little turriculate; the first two are smooth, the remaining finely costulate. The columella is straight but truncate." (*Morelet*).

Figured from specimens received from Marie. The conspicuously ribbed surface and diminutive size distinguish it from other species of the Comoros. The protoconch has sparse, almost subobsolete spiral striæ.

Subgenus Eremopeas Pilsbry.

9. P. interioris (Tate). Pl. 25, figs. 17, 18.

"Shell cylindrical, spire very long and tapering to an obtuse apex; very thin, shining, greenish-white or pale yellowish; ornamented with slender, crowded, slightly arcuate axial riblets, approximately as wide as the interspaces. Whorls nine, almost flat, but abruptly descending to the deeply impressed suture. Aperture elongate-oval; peristome simple, acute; columellar margin nearly straight, thinly and narrowly reflected, and almost concealing a minute umbilical fissure. Length 10.5, diam. about 2.25 mm." (*Tate*).

Central Australia: extending east and west from Hart's Range to Stokes' Pass, and north and south from the north and outer flanks of McDonnell Range to Ilpilla Gorge (Tate).

Stenogyra interioris Tate, Trans. Roy. Soc. South Australia xviii, 1894, p. 191; Report Horn Exped. to Central Australia, pl. 2, Zoology, p. 203, pl. 18, f. 14, 1896.

With the exception of *Pseudopeas tuckeri* of the tropical Queensland coast, this is the only *Opeas-like* snail of Australia. Hedley has referred it to *O. gracile,* but without, I think, sufficient consideration. The shells I opened contained oblong embryonic shells of about 2½ whorls, arranged in a single series like the eggs of *Opeas.* This acceleration is probably an adaptation to conditions of excessive aridity, unfavorable to the development of young from eggs.

The sculpture of the protoconch (pl. 25, fig. 18) has not been noticed hitherto. There are low weakly tuberculate spiral threads, which cease at the conclusion of the nepionic stage. My specimens were received from Professor Tate, and are part of the original lot.

10. P. tuckeri (Pfeiffer). Pl. 22, figs. 7, 8; pl. 24, figs. 27, 28.

Shell perforate, cylindric-subulate, thin, longitudinally distinctly striate, rather glossy, waxen. Spire long, the apex rather acute; whorls 9, a little convex, the last scarcely one-fourth the total length. Columella obliquely receding. Aperture oval-oblong; peristome simple, acute, the columellar mar-

gin dilated above. Length 9, diam. 2.75, aperture 2x1.25 mm. (*Pfr.*).

Sir Charles Hardy's Island, on the northeast coast of Queensland (Tucker, type locality); also Fitzroy, Sunday and Lizard Islands (Macgillivray), and other islands within the Great Barrier reef and Torres Straits; mainland of Queensland; Prony Bay, New Caledonia.

Bulimus tuckeri Pfr., P. Z. S., 1846, p. 30; Monogr., ii, p. 158; viii, 138.—Reeve, Conch. Icon., v, pl. 68, f. 481.—Forbes, Voy. H. M. S. Rattlesnake, ii, p. 372 (N. E. coast Australia).—Cox, Monogr., Austr. Land Shells, p. 69, pl. 13, f. 9 (Brisbane to Cape York, Queensland; Clarence Heads, N. S. Wales; introduced at Sydney).—Petterd, Journ. de Conch., 1877, p. 361 (Emigrant Creek, sources of Tweed River and southern Queensland).—Brazier, Quart. Journ. of Conch., i, p. 272 (Is. of Torres Sts.).—*Stenogyra tuckeri* Tate, Rep. Horn Exped., Zool., p. 203 (Port Darwin).

The shell tapers straightly to the obtuse summit. The whorls are very convex just below the suture, and are sculptured with very fine but distinct, almost thread-like striæ, which are almost vertical, but a little curved forward. The first 1½ whorls have only very faint spiral lines, less distinct than in *P. interioris*, but of the same nature. The suture in well-sculptured shells is irregularly crenate by reason of small denticles formed by the coalescence of groups of striæ; but this appearance is often hardly noticeable, and some shells seem to have an even suture. Instead of the usual round white eggs, sexually mature shells contain minute, subglobular young shells. Specimens measure as follows:

Length 8.2, diam. 2.5, aperture 2.3 mm., whorls 7½.

Length 7.3, diam. 2.4 mm., whorls 6¾.

Length 7.6, diam. 2.2 mm., whorls 7½.

While *P. tuckeri* is evidently related to *P. interioris*, yet it certainly differs by the wider contour, larger mouth and fewer whorls in specimens of the same length. The sculpture of *P. interioris* is coarser. *P. tuckeri* has been confused by all recent authors with the Polynesian *Opeas junceum*, a species which I think differs generically.

Whether the form reported as introduced at Sydney is correctly identified as *P. tuckeri* I do not know; but it is more likely to be *Opeas gracile, O. javanicum*, or some of their errant brothers.

Genus OPEAS Albers, 1850.

Opeas Alb., Die Hel., p. 175, first species *B. subula* Pfr.—Hermannsen, Indicis Generum Malac., Suppl., p. 96, Dec., 1852, *B. subula* Pfr. mentioned as type.—Crosse et Fischer, Miss. Scient. Mex., Moll., i, p. 592; same type.—Martens, Die Hel., edit. 2, 1860, p. 265 (*Stenogyra goodalli* selected as type).

The shell is small, thin, turrite, usually perforate, with large, obtuse, rounded apex and convex or flattened whorls, corneous or yellowish. Embryonic whorls smooth. Aperture small, ovate, the outer lip thin, usually arched forward, columella straight or concave, not sinuous, the columellar lip reflexed, curving into the basal lip and not toothed or truncate below. Oviparous, the egg-capsules large and spheroidal. Type *O. subula* Pfr. (*O. gracile* Hutt.).

Opeas contains small, thin, oviparous Stenogyrine snails with the apex large, obtuse, rounded and smooth, and the columellar margin reflexed, rounded below, or at least not distinctly truncate. The species are spread throughout tropical and subtropical regions, but as yet none is known from Australia. A few species colonize freely, and have spread wherever commerce reaches in suitable climates. Others, restricted to special stations not to be found in cultivated areas, are as local as most other land snails. Owing to the similarity of the shells, their determination is difficult, and demands the greatest application.

Opeas stands very close to the groups *Prosopeas* and *Curvella*. The former differs by merely such minor features as the rougher, often minutely lamellose sculpture, the greater size and flatter whorls, but these give the shell a rather different aspect. *Curvella* in its typical forms differs by the short and Bulimoid shape; but some of the species are arbitrarily referred to one or the other genus. The distinction between

Opeas and *Curvella* is by no means convincing; yet even small differences have significance which may usefully be recognized in dealing with large groups of similar species.

Opeas and *Subulina* begin to reproduce before the shell has attained its full size, usually when it is about two-thirds grown.

Dimorphism. In many species two forms co-exist in the same colony, a more slender and a stouter; all other features remaining the same. Intermediate contours usually occur if a large gathering is at hand. See plate 16, figs. 89, 90. This dimorphism must be kept in mind, especially when dealing with small sets.

The species are here separated geographically into (A) Old World and (B) American species.

(A) Old World Species.

Excepting a few forms spread by commerce or other means, the Old and New World species are distinct. Most of the Eastern forms belong to typical Opeas.

Several minor groups are indicated by slight conchologic features. In one group which may be called *Tomopeas*, n. sect., the columella is calloused below and subtruncate. Type *O. layardi* (pl. 16, fig. 83); also *O. avenaceum, O. soror, O. brevior.*

In another group which I term *Comoropeas*, n. sect., the shell is wholly imperforate, covered with a colored cuticle; first whorl rounded, the rest rather flattened, the first two smooth. Type *O. apiculum* Morel.; *O. longulum* also belongs here. These forms may not belong to the genus *Opeas*; they seem related rather to the Trichodinas of the Comoros (see vol. XVII, p. 188); yet they have not trochoidal apices like that group, but an obtuse, rounded summit, much as in *Opeas.*

Another series may eventually be transferred to *Prosopeas*, including the species *javanicum, pilosum, pruinosum, kusaiense* and *fagoti*, characterized by the densely striate and briefly lamellose surface.

A single species, *O. carinatum*, no. 38, is described as with

the last whorl carinate. All other forms have the whorls rounded.

The species are grouped geographically, thus:

I. Generally distributed, colonizing species, no. 1 to 4.
II. West African, no. 5 to 14.
III. East African, no. 15 to 21.
IV. South African, no. 22 to 26.
V. Species of the Comoro, Mascarene and other East African islands, no. 27 to 34.
VI. Species of Southeastern Asia, Ceylon to Tonkin, no. 35 to 43.
VII. Chinese species, no. 44 to 68.
VIII. Japanese Empire, no. 69 to 71.
IX. East Indian species, Nicobar Is. to New Caledonia, no. 72 to 80.
X. Philippine and Caroline species, no. 81 to 90.
XI. Polynesian and Micronesian species, no. 91 to 93. (Australian species, see *Pseudopeas*).

I. *Generally distributed species.*

Several species of *Opeas* in each hemisphere have been enabled, by their hardiness and adaptability to life in cultivated areas, to colonize over a large part of the tropical and subtropical zones. There cannot be much doubt that the carriage of living plants from place to place has been a chief factor in the dispersal of *Opeas*, and of *Subulina octona*, *Vallonia*, *Agrolimax lævis* and other snails as well. The habits of these forms are such that they find practically the same environment anywhere in zones of similar temperature, and their spread from new centers is often very rapid. *Opeas gracile* is probably the most widely distributed land snail in the world.

Three American species have been introduced into the Old World: *O. goodalli* Mill., frequently found in English hothouses, and acclimated in Rodriguez, the Cape Verde and Hawaiian Islands, and *O. swiftianum* Pfr. and *micra* Orb. in Mauritius, where they were taken by Nevill.

In some islands the whole Stenogyrine fauna has apparently

been introduced by commerce. I believe this to be the case in the Mascarene and Hawaiian groups, where the following species have been found:

Mauritius.	*Hawaiian Is.*
O. gracile.	O. oparanum.
O. clavulinum.	O. clavulinum hawaiense.
O. mauritianum.	O. mauritianum.
O. javanicum.	O. javanicum.
O. swiftianum.	O. opella.
O. micra.	O. goodalli.

At least four species of the above lists may be expected to occur anywhere in the warm zone. The failure to recognize this has resulted in numerous synonyms.

1. O. GRACILE (Hutton). Pl. 18, figs. 3, 4, 5, 6.

"Shell transparent, thin and pale-colored or rather colorless; spire gradually tapering; whorls 12, body-whorl equal to the two preceding ones. Aperture longer than broad, semi-ovate; pillar-lip straight and slightly reflected; right lip edged. Length 6½ lines. I have only one of this length, the generality being about 5 lines. It has also 12 whorls while the others have about 9 or 10" (*Hutton*).

India, type locality Mirzapur, Ceylon and the East Indies, China, Formosa and Japan, etc.; Mascarene Islands; Polynesia.

Bulimus gracilis HUTTON, Journ. Asiat. Soc. Bengal iii, 1834, p. 93 and p. 84 (no. 5, *Bulimus*?).—REEVE, Conch. Icon. pl. 69, f. 495.—PFR., Conchyl. Cab. p. 79, pl. 21, f. 18, 19; Monogr. ii, 157; iii, 399; iv, 458; vi, 96.—HANLEY & THEOB., Conch. Ind. pl. 23, f. 4.—*Stenogyra gracilis* Hutt., MARTENS, Ostas. Landschn. p. 83, 375, pl. 22, f. 13; pl. 19, f. 5 (Bangkok; Ganges valley, India; Pointe de Galle, Ceylon; Pulo Pinang, near Malacca; Sumatra; Java, Borneo, Celebes, Timor, Adenare and Solor; Amboina, Buru, Ceram, Banda-Neira).—NEVILL, Handlist Moll. Ind. Mus. i, p. 164 (Assam; many localities in British India and Ceylon; Andaman Is.; Singapore; Sarawak; Jalk, Persia).—BLANFORD, Obs. on

Geol. and Zool. of Abyssinia, 1870, p. 476 (Adabagi, Tigre, identification not positive). — Crosse, Journ. de Conchyl. 1874, p. 229 (Rodriguez)—G. Nevill, J. A. S. Bengal, xlvi, pl. 2, p. 25, 1877 (Tsagain and Bhamo, Yunnan exped.).—Crosse & Fischer in Grandidier, Moll. Madagascar, pl. 24, f. 1. — Martens, Landschnecken des Indischen Archipels, in Max Weber, Zool. Ergebn. einer Reise in Niederländich Ost-Asien, ii, p. 243, 1891 (Sumatra & Celebes).—Tapperone Canefri, Ann. Mus. Civ. Genov. xix, p. 88 (Aru Is.); xx, p. 144 (Amboina).—Boettger, Nachrbl. 1890, p. 89 (Nossi-Be, Hongkong, Canton, Macau, Hainan, Barma, Bombay; Lenkoran on the Caspian Sea, dead and accidentally introduced).

Opeas gracile (Hutt.) Boettger, Bericht Senckenbergische naturforsch. Gesell., Frankfurt, 1891, p 272 (Moluccas: Amboina, Haruku, Saparua, Buru; also Banda Neira, Banda Is., Adenare and Flores); Land fauna der Marschall-Inseln, in Zool. Jahrb., abth. f. Syst. Geogr. u. Biol. Thiere, xx, p. 410, 1904 (Nauru, Marshall Is.; also Art I., Mindanao, Cebu, Luzon, Paragua).—Schmacker & Boettger, Nachrbl. 1891, p. 178 (Formosa).—Mlldff., P. Z. S. 1891, p. 337 (Bukit Pondong, Hungerford); Nachrbl. 1892, p. 99 (Tenimber Is.); P. Z. S. 1894, p. 151 (Samui Is.); Journ. of Malac. vii, 1900, p. 113 (Yap & Ponape Caroline Is.); Nachrbl. 1900, p. 134 (Touranne).—Goodwin-Austen, P. Z. S. 1895, p. 443 (Andaman Is.).—Blanford, Proc. Malac. Soc. Lond. V, p. 280, 1903 (Lampun, Siam).—Crosse, Journ. de Conchyl. 1881, p. 201 (Nossi-be, Nossi-Comba).—Fischer & Dautzenb., Mission Pavie Indo-Chine, Zool., p. 411 (Haiphong, etc.).—Mt Soutem near Chieng Mai (Pavie; Morlet) J. de C. 1891, p. 232; Obi (Dautzenb., J. de C. 1903, 14). — *Opeas gracilis* Alb. var. *Op. ægyptiaca* Bourg., Jousseaume, Bull. Soc. Malac. France vii, p. 101, pl. 3, f. 4-6 (Suez, Egypt).—E. A. Smith, The Fauna and Geography of the Maldive and Laccadive Archipelagoes i, pt. 2, p. 143 (Maldive and Laccadive Is.).—Jousseaume, Bull. Soc. Malac. France vi, 1889, p. 358 (Aden, Djeddah, Suez).—*Limicolaria bourguignati* Paladilhe, Ann. Mus. Civ. Genova iii, 1872, p. 18, pl. 1, f. 13, 14 (Aden). *Cf.* Blanford, J. A. S. Bengal, 1875, and Bgt., Moll. Afric. Equat. p. 91, footnote.

Bulimus indicus Pfr., P. Z. S. 1846, p. 40; Monogr. ii, p. 135 (East Indies). — *Opeas indicus* Pfr., Dautzenberg, Journ. de Conch. liii, Dec. 1905, p. 102 (Tonkin).—*Bulimus cereus* Reeve, Conch. Icon. v, *Bulimus* no. 501, pl. 17 *Achatina*, f. 81, July, 1849. (Moradabad, India).—*Bulimus apex* Mousson, Land und Süsswasser Moll. Java p. 35, pl. 4, f. 5 (Java).

Bulimus subula Crosse & Fischer, Journ. de Conch. 1863, p. 361, pl. 14, f. 6 (Saigon, and Fuyen-Moth, Cochin China). —"*Opeas subulata* Pfr.," Hungerford in coll., *teste* Garrett (Hong-Kong).—*Opeas subula* Pfr., Mlldff., Annuaire Mus. Zool. Acad. Imp. Sci. St. Pétersbourg, VI, 1901, p. 390 (Tapa on the Tung river; between Shuang-liu and Hsin-dshing, Sytshuan, China). Smith, monograph of Christmas Island p. 57, 1900 (Christmas I., Ind. O.).

? *Bulimus decorticatus* Reeve, Conch. Icon. v, pl. 80, f. 592 (Macao, China); *Cf.* p. 34.

Helix clavulus Quoy et Gaimard, Voy. de l'Astrolabe, Zool. ii, p. 133, pl. 11, f. 30-33 (Ile de France).

M. Dautzenberg states that Hutton described this species without specific name in 1834; but Hutton on p. 93 of his paper gives a table of the names, expressly indicating those he had named.

This species, including *O. subula* which I agree with Boettger is not separable from *gracile*, has a wide range in the tropics of both hemispheres. In the Old World it is especially characteristic of the Oriental Region of Wallace, but passes beyond into Polynesia, and in the northeast reaches to Japan, which has an Oriental land-snail fauna. Westward it reaches Aden, probably Abyssinia, British East Africa and the Mascarene Is.

It is perforate, slender, and regularly, straightly tapering to the small, obtuse apex, pale-yellowish corneous, without much gloss. The moderately and regularly convex whorls are very distinctly, arcuately striate. The suture is usually a trifle irregular, and often quite distinctly crenulate, and the surface below it is more or less distinctly puckered. The aperture is long, rhombic-ovate, and the columel-

lar margin is widely reflexed. Two specimens from Ahmednuggur measure:

Length 12, diam. 3.5, aperture 3.8 mm., whorls 8½.

Length 13, diam. 3.1, aperture 3.7 mm., whorls 9.

These shells (pl. 18, figs. 3-5) illustrate the slender and stouter phases of the species, usually to be found in any large lot from one place.

The series before me from Mauritius, Ceylon, India, China, the Philippines, etc., shows but little variation except in size.

Specimens from Okinawa, Ryukyu, have slightly more convex whorls, the striation is a trifle weaker and they are more glossy (pl. 18, fig. 6), the one figured measuring 12.8 x 3.5 mm., with 8½ whorls. Further north *O. gracile* has been found by Mr. Hirase in Kyushu, Hondo and even as far as Kayabe, Ojima, in the island of Yesso—further north than any other species of the genus. A shell from this place measures 11.3 x 3 mm., with 9 whorls. It has been found by Mr. Hirase's collector on Kita-iwojima, one of the Sulphur group, near the Bonin Islands, and on Hahajima, Ogasawara (Bonin Is.); the form occurring there (pl. 22, fig. 10) being small, 8 mm. long, with 7 whorls, the suture subtly crenulate in places. It is thin and delicate, as might be expected on volcanic soil.

The Chinese *Bul. fortunei* Pfr. and "*B. scalaris* Desh." have been considered synomyms of *O. subula* Pfr. by Gredler. The former is placed in the synomyms of *Bul. decorticatus* Reeve by von Martens. I have not the material for deciding this question. See page 34. *Bulimus cereus* Reeve (pl. 18, fig. 7) was based on an Indian specimen of *gracile*.

The following form from the Nicobar Islands is apparently synonymous. "*Opeas apex* Mouss., var. *nicobarica*. Shell narrowly turrited, waxen outside, white within, with 7½ quite convex whorls, the first two smooth, yellow, the rest irregular, costulate-striate, the riblets obsoletely sigmoid, especially on the last whorl, and with very obsolete spiral lines, stronger on the base. Suture deep, subcrenate, more distinctly so in the middle whorls. Aperture subelliptical, somewhat narrow anteriorly, inner lip reflexed, with a very obso-

lete fold in the middle; rimation punctiform. Length 9, diam. 2.5, aperture 2.5 mm. long'' (*Moerch*, Journ. de Conchyl. xx, 1872, p. 313).

Nicobar Is.: Nancouri, one specimen under the bark of a tree (Kjellerup).

''*Opeas apex* of Java differs by its thicker epidermis, its wider columella and less narrow umbilicus.'' A small form found with the type is less narrow, the suture more strongly crenulate in the middle, aperture shorter and rounded, not narrowed, in front; length 8, diam. 1.5 to 2.66 mm.

In Mauritius (pl. 23, fig. 23) the shells do not reach so large a size as in Ceylon, etc., but are otherwise practically typical. A series collected by Sir Charles Eliot at Takaungu, on the coast of British East Africa in lat. 3° 42′ south (pl. 23, figs. 24, 25) also fall short of the maximum size, the two figured measuring 10 x 3 and 8 x 2.6 mm., both with 7½ whorls, the suture crenulate in the upper half of the shell's length.

New Caledonian form.—The original description and figures of *O. souverbianum* (pl. 24, fig. 31) and of *O. artense* (pl. 24, fig. 32) are given below. These seem to me to pertain to the more obese and more slender phases respectively of one and the same species, which I am unable to distinguish from *O. gracile*. E. L. Layard, of Noumea, the well-known collector of New Caledonian shells, ''maintained that there was no difference between *S. souverbiei, S. artensis, S. tuckeri* and the Ceylon species,'' the latter being *O. gracile* (P. Z. S. 1888, p. 358). The specimens before me from Noumea, Art Island and Ile Casy, received from G. Dupuy and E. Marie, support the reference to *O. gracile*. They are however a small form, not reaching the dimensions of typical *O. gracile*. Shells from Noumea (pl. 24, figs. 40, 41, slender phase) measure 8.8 x 2.8 and 8.8 x 2.2 mm., with 7¾ and 8 whorls. The striæ are stronger below the somewhat crenulate suture, as usual.

B. souverbianus Gassies. (Pl. 24, fig. 31). ''Shell turbinate, elongate, not umbilicate, pellucid-buff, fragile, diaphanous, longitudinally delicately striate; whorls 7, regularly

increasing, the last half the total length; suture deep. Aperture ovate-elongate; columella slightly calloused, peristome simple. Length 7, diam. 2.5 mm. (*Gass.*).

New Caledonia: Art Island (Montrouzier).

Bulimus diaphanus Gass., Journ. de Conchyl. vii, 1859, p. 370; not of Pfr. 1854.—*Bulimus souverbianus* Gass., Faune Conch. Nouvelle-Calédonie i, p. 52, pl. 2, f. 5 (1863). —Pfr., Monogr. vi, 98.—*Opeas s.*, Crosse, J. de C. 1894, p. 299.

B. artensis Gass. (pl. 24, fig. 32). Shell imperforate, turbinate, rather lengthened, pale corneous, thin, diaphanous, glossy, longitudinally delicately striate. Whorls 7 to 8, slightly convex, regularly increasing, the last forming one-third the total length; suture deep, apex rather obtuse. Aperture ovate-elongate, columella arcuate, slightly calloused; peristome simple, acute. Length 9, diam. 2 mm. (*Gass.*).

Art Island, New Caledonia.

Bulimus artensis Gass., Journ. de Conchyl. 1866, p. 50; Faune N.-Caléd. ii, p. 94, pl. 3, f. 9.—Pfr., Monogr. vi, 98.—*Opeas artense* Crosse, J. de C. 1894, p. 300.

Var. neocaledonicum nov. (Pl. 24, fig. 29.) A narrow, slowly-tapering and attenuate-spired form perhaps referable to *O. gracile* as a variety, is before me from New Caledonia (Marie). This slender form differs from *O. gracile* by its shorter aperture and obliquely drawn-out whorls. The suture is narrowly margined, not crenulate; the striation is fine and delicate, the whorls long, the last two rather flattened. The specimen figured measures 7.9 mm. long, 2 wide, with fully 7 whorls. This will probably prove to be a distinct species. There are several narrow species, which need comparison, in the East Indies and China. *O. pyrgula* of Japan has a stronger sculpture.

Polynesian forms of O. gracile.—In Polynesia I have seen forms of *O. gracile* from the Viti, Samoan and Society groups, and from Washington (or New York) island. It has been

reported from Funafuti, the Marshall and the Caroline Islands.

The shells before me are all smaller than typical *gracile*. In most of them the suture is finely but distinctly denticulate in places, chiefly in the upper half of the shell. I have figured a shell from Tahiti, pl. 22, fig. 4, nine mm. long with over 7 whorls and nearly smooth suture, and a more slender Samoan shell, pl. 22, fig. 11, received from Schmeltz as "*upolensis* Mouss." It is 8.8 mm. long, with 7¾ whorls.

Bulimus junceus Gld. was based upon the small Polynesian race of *gracile*. The description follows, with a copy of the original figure.

B. junceus Gld. (pl. 22, fig. 6). "Shell small, thin, translucid, elongated, turreted, of a pale green color, obtuse at apex, covered with delicate longitudinal striæ. Whorls seven, slightly convex, presenting a broad shoulder above. Aperture long ovate: lip simple, on the left slightly reflected over a minute umbilical chink: the last whorl about one-third the length of the whole shell. Length of axis three-tenths of an inch; breadth one-tenth of an inch (*Gould*).

"Inhabits Tahiti and Eimeo. This shell very closely resembles a West Indian species, and is, perhaps, the same, and may be a denizen of the cocoanut or banana, wherever found. *B. bacterionides* agrees in form, but this is *not* 'smoother than *octona*,' and has not nine whorls." (*Gould.*)

Bulimus junceus Gld., Proc. Bost. Soc. N. H. Dec. 1846, p. 191; Expedition shells p. 32; Moll. U. S. Exploring Exped. p. 76, pl. 6, f. 87.—Pfr., Monogr. ii, 220; viii, 138.—*Stenogyra juncea* Gld. Binney Ann. N. Y. Acad. Sci. iii, p. 100, (teeth of Huahine specimen).—*Opeas junceum* Gld., Martens, Sitzungsbr. Nat. Freunde 1898, p. 156 (Cocos I.).—Boettger, Bericht Senck. Ges. 1891, p. 272 (Moluccas, Hainan, etc.)—*Opeas juncea* Gld. var., Gredler, Malak. Bl. (n. F.) ix, p. 142 (Macao I.).—Smith, Ann. Mag. N. H. xx, 1897, p. 521 (Rotuma).—*Stenogyra gracilis* Hutton, Hedley, Mem. Austr. Mus. iii, 1899, p. 488 (Funafuti).

Var. panayense (Pfr.). (Pl. 18, figs. 1, 2.) Shell imper-

forate, subulate, thin, smooth, pellucid, waxen, hyaline. Spire elongate, the apex obtuse. Whorls 8, wide, a trifle convex, the last scarcely one-fourth the total length; columella short, rather straightened. Aperture oval-oblong, the base subangulate; peristome simple, unexpanded, the columellar margin shortly reflexed, appressed. Length 11, diam. 2.5, aperture 2.5 x 1.33 mm. (*Pfr.*).

Philippines: Dingle on the island Panay (Cuming, type locality); see next paragraph for further localities.

Blimus panayensis Pfr., P. Z. S. 1846, p. 33.—Reeve, Conch. Icon. v, pl. 14, f. 76.

Stenogyra panayensis Pfr., Martens Ostas. Zool. p. 83, 376, pl. 22, f. 8 (Siam, Timor, Ternate); Webers Zool. Ergebnisse Reise in Niederl. Ost-Indien, ii, p. 243 (Maumeri, Flores); Sitzungsber. Ges. Naturforsch. Freunde Dec. 1896, p. 163 (Lombok).—Hidalgo, Journ. de Conch. 1888, p. 34 (Philippines).—Semper, Reisen, p. 137, pl. 8, f. 15, pl. 11, f. 17, 21 (Philippine Is.; living animal, genitalia and teeth).—Tapperone Canefri, Ann. Mus. Civ. Genova xix, 1883, p. 87 (Aru Is.); xx, p. 144 (Amboina).—*Opeas panayensis* Pfr. Fisch. & Dautz., Mission Pavie Indo-Chine, iii, p. 411 (Siam, Tonkin, Saigon).

As originally described, this form would seem to differ from *O. gracile* by the imperforate axis, more slender shape and smooth surface. The above description and figure 2 apply to this type form, which subsequent investigators do not seem to have found.

Prof. von Martens identified as *panayensis* a perforate shell with striate whorls, typically more slender than *O. gracile,* but believed by competent recent authorities, von Moellendorff for instance, to intergrade with *gracile,* of which it would be considered a synonym. Von Marten's figure is copied, pl. 18, fig. 1. All but the first two references given above seem to pertain to this Martensian *panayensis,* which, if rightly identified by various authors, has a general distribution from Indo-China to the Moluccas and Aru Is.

2. O. MAURITIANUM (Pfeiffer). Pl. 17, figs. 92 to 96.

"Shell subperforate, somewhat cylindrically turrited, rather thin, striated (some of the lines more elevated), diaphanous, waxen; spire elongated, somewhat acute; whorls 7, a little convex, the last almost equal to one-third of the length of the shell, slightly tapering towards the base; columella rather straightened. Aperture vertical, oblong-ovate, peristome simple, unexpanded, the right margin evenly arcuate, columellar margin very narrowly reflexed to the base. Length 9, diam. 3, length of aperture 3, breadth 1½ mm." (*Pfr.*)

Island of Mauritius (*Pfr.*); Petit Sable, Mauritius (*Möbius*).

Bulimus mauritianus PFR., Proc. Zool. Soc. London, xx. p. 150, (1852); Conch. Cab. (Bulimus) p. 86, pl. 30, f. 15, 16; Monogr. iii, 1853, p. 402; iv, p. 462; vi, 100.—? *Subulina mauritiana* Pfr., NEVILL Proc. Zool. Soc. London, 1869, p. 64 (Mahé and Silhouette, Seychelles).—*Stenogyra* (*Opeas*) *mauritiana* Pfr., MARTENS in Möbius, Beitr. zur Meeresfauna der. Insel Mauritius und der Seychellen, Reise nach Mauritius 1874-75, p. 199.—? *Stenogyra* (*Opeas*) *clavulinus* P. & M., G. NEVILL, Journ. Asiat. Soc. Beng. vol. 39, pt. 2, 1870, p. 409 (Bourbon).

Pfeiffer's description and figure (pl. 17, fig. 96) were from an immature shell. When full grown (pl. 17, figs. 92-94, Mauritius) there are fully 8 whorls. It is *very glossy*, only weakly striate, and the spire has *distinctly convex* outlines, being *wide above*, with the subcylindric contour Pfeiffer mentions. This characteristic shape is much less noticeable in young or immature shells, the form of which is fairly well shown in Pfeiffer's figure. The outer lip is moderately arched forward. Length of an adult shell 11.5, diam. 3.4, aperture 3.3 mm.

The specimen shown in figs. 92 to 94 is from Mauritius. The apex is badly drawn in fig. 92. Nevill's record of the species from the Seychelles needs confirmation, as I learn from specimens of *Opeas* received from him that his iden-

tifications of these difficult forms were sometimes ill-founded. His *O. clavulinus* from Bourbon was probably *O. mauritianum*, at least in part.

Fig. 95 of pl. 17 represents a specimen from Maui, Hawaiian Is., measuring length 12.7, diam. 3.5 mm. Like the rest of the *Opeas* fauna of the Hawaiian group, it is doubtless an immigrant there. I have also specimens collected in Washington, D. C., probably from a greenhouse. They were sent about twenty years ago by Rev. E. Lehnert, a reliable and at that time well-known collector.

Opeas prestoni Sykes of Ceylon differs by having the spire a trifle less obese, more straightly tapering than the most strongly characterized *O. mauritianum*, yet in a series of both, these differences would not serve to separate them if mixed. I doubt whether the nominal rank of a variety can be upheld except on purely geographic grounds.

Var. *prestoni* Sykes. Pl. 17, figs. 98, 99, 100.

Shell subperforate, long-cylindric, translucent, thin, corneous or waxy-corneous, the apex somewhat obtuse; whorls 8½, plano-convex, longitudinally striated with growth lines, the last whorl about nine-twentieths the total length; suture well impressed; aperture elongate-ovate; peristome simple, acute, the columellar margin narrowly reflexed to the base, nearly covering the perforation. Length 11, diam. 3.25, aperture 3 x 1.8 mm. (*Sykes*).

Ceylon: Uda Pussellawa (Preston).

Opeas prestoni Sykes, Proc. Malac. Soc. Lond. iii, p. 73, pl. 5, f. 4 (July, 1898).

Fig. 98 is a copy of Sykes' original. Figs. 99, 100 are from Ceylon specimens received from Mr. Collett.

Var. *obesispira* Pilsbry. Pl. 17, figs. 101, 102.

Shell minutely perforate, turreted, translucent, corneous, the columella visible through the shell; glossy, with faint, arcuate wrinkles. *Lateral outlines of the spire decidedly convex above.* Whorls about 8½, moderately convex, separated by impressed sutures, which appear to have a trans-

lucent margin below. Aperture subvertical; outer lip thin, arched forward in the middle, somewhat retracted below. Columella subvertical, with a distinct spiral twist below; its edge reflexed above. Length 12, diam. 3.3, longest axis of aperture 3.3 mm.

Ryukyu Is.: Okinawa (Hirase).

Opeas obesispira Pils., Proc. A. N. S., Phila., 1904, p. 638.

Very closely related to *O. mauritianum*, but the whorls are more convex and smoother, and the sutural margin distinct.

3. O. CLAVULINUM (Potiez et Michaud). Pl. 23, figs. 17, 21, 22.

"Shell turrited, fragile, glassy, shining, diaphanous; whorls 6, convex, the last larger; aperture ovate above and to the left angular; peristome simple, acute; apex obtuse. Length 8 mm.

"This shell makes, so to speak, a transition from *Bul. clavulus* to *Bul. oryza*, which is the shortest; its last whorl is proportionately larger than that of its two congeners, its summit is more obtuse and it is a little more ventricose." (*P. & M.*)

Bourbon Is. (*P. & M.*); Mauritius (Nevill); Seychelles (Brauer).

Bulimus clavulinus P. & M., Galerie des Mollusques du Mus. de Donai i, p. 136, pl. 14, f. 9, 10, 1838. — *Opeas clavulinum* Marts., Land und Süsswasser-Mollusken der Seychellen, in Mittheil. Zool. Sammlung Mus. f. Naturkunde Berlin, i, p. 23, 1898.

The original description and figures (fig. 17) are given. The species has been so variously identified, that references to the literature would be useless and misleading.

The species I take to be *clavulinum* is related to *johanninum* and to *mauritianum*, but it is smaller than the latter, with the spire less swollen above. The specimens figured are from Mauritius (pl. 23, figs. 21, 22). The shell is openly perforate, pale yellowish-corneous; striate, but the sculpture is decidedly weaker than in *O. gracile*; glossy. The sides slope almost straightly, but are a little convex

near the obtuse apex. The upper part of the spire is wider than in *O. gracile*. Whorls 7, moderately convex; the suture slightly irregular but not crenulate. Aperture about as in *O. gracile*. Compared with *O. johanninum*, this species is smaller, less conic, and less deeply-grooved longitudinally. Length 7, diam. 2.4 mm.

Specimens collected by Dr. A. Brauer in Mahé, Seychelles, in the plain and lower valleys, are described by von Martens as 8 mm. long, fully 2 wide, with 7 whorls.

The following forms are scarcely separable except by their distribution. Both, however, seem to be less openly perforate.

Var. *hawaiiense* Sykes. Pl. 17, fig. 97.

"More cylindrical [than *O. prestoni*], i. e., the earlier whorls increase more rapidly and the later ones less so, the color is pale yellowish-white whereas the Ceylon shell is a light horn color, the texture of the shell is thinner and more transparent, and the specimens I have seen are, on the average, smaller" (*Sykes*).

"Hawaii: Kawailoa, Mauna Loa, at 1500 ft. (Perkins); Hilo (Henshaw)." Also Honolulu (Dr. Wm. H. Rush). Kauai: Hanalei (Dr. B. Sharp, 1893). Maui (D. D. Baldwin). Oahu, at Round Top and Manoa Valley (Bishop Museum).

Opeas prestoni n. var. *hawaiiensis* Sykes, Proc. Malac. Soc. Lond. vi, p. 113, fig. 3 (June, 1904).

Mr. Sykes figures a specimen which from the size-mark was 9 mm. long. Most of those before me are smaller, about 7 mm. long. The perforation is very small, as in the Japanese form which I have called *kyotoense*. Probably this Hawaiian snail was brought there from Japan. A copy of Mr. Sykes' original figure is given.

Var. *kyotoense* Pilsbry. Pl. 21, figs. 3, 4, 5, 6.

Shell almost imperforate, turrited, translucent, waxen whitish, glossy, arcuately, inconspicuously wrinkle-striate, smoother below. General slope of the sides straight, apex very obtuse. Whorls 7½, quite convex, separated by deeply impressed sutures. Aperture slightly oblique, somewhat ef-

fuse below; outer lip sinuous, thin; *columella straight,* vertical, the edge reflexed and appressed except for a minute umbilical chink.

Length 10, diam. 3.3, aperture 3.3 mm. (Kayabe).

Length 7, diam. 2.8, aperture 2.7 mm. (Kyoto).

Length 7.7, diam. 2.7, aperture 2.3 mm. (Kyoto).

Japan: Kyoto, Yamashiro. Types No. 78,757, A. N. S. P. Also Kashima, Harima, etc.

O. kyotoensis Pils., Proc. A. N. S. Phila. 1904, p. 638 (Nov. 2, 1904).

This form is much more glossy than *O. gracile,* less deeply striate. It is not quite so glabrous as *O. mauritianum prestoni,* which moreover is more swollen near the summit, and larger, with shorter whorls. The straight, vertical columella, not expanding above, and forming a distinct angle with the parietal wall is also characteristic. It resembles *O. clavulinum* in almost every detail except the umbilical perforation, which is smaller, nearly closed. The aperture is rather short and wide. The apex is large and the suture even, not crenulate. Figs. 3, 4, 6 represent typical specimens from Kyoto, 6 being a young shell.

Some specimens which I refer to this species from Kayabe, Ojima, in Yesso, are larger and a little more distinctly striate, with the columella slightly arcuate. Others from Sado Island are similar.

A form from Kikai-ga-shima, Osumi, in the Oshima group of the Ryukyu Is., differs by having a narrower aperture (pl. 21, fig. 5).

There is a tendency in Kyoto specimens toward a stout form, when young resembling *O. brevispira* to some extent. One of these is figured, pl. 21, fig. 6. I have some doubt whether *kyotoensis* can be considered even varietally distinct from *hawaiense.*

O. c. kyotoensis appeared in large numbers in Phipp's conservatory in Schenley Park, Pittsburgh, Pa., in 1897. Specimens from this source were distributed by Mr. G. H. Clapp at that time.

4. O. JAVANICUM (Reeve). Pl. 12, figs. 14, 16; pl. 16, figs. 81, 88; pl. 22, fig. 9.

Shell oblong, turrited; whorls 8, rounded, obscurely, very finely, rudely striated; columella thin, attenuately truncated; aperture small. Pale straw color. (*Rve.*).

Java: Wonosari (Zollinger). Flores at Larentuka and the neighboring island of Adenare. Moluccas on the islands Ternate and Amboina (Martens), Sumatra, China, Japan, Hawaiian Is., Mauritius, etc.

Achatina javanica RVE., Conch. Icon. v, pl. 17, f. 79 (1849).—PFR., Monogr. iii, p. 493.—*Stenogyra j.*, MARTENS, Ostas. Zool., Landschn. pp. 30, 377, pl. 22, f. 11; Sitzungsber. Ges. Nat. Freunde zu Berlin, 1877, p. 105 (Japan).—*Hapalus j.*, MARTENS, Beschalte Weichthiere D. Ost-Afr. p. 130.—? *Opeas clavulinum* (Pot. Mich.) BTTG., Nachrbl. d. D. Malak. Ges. 1891, p. 179 (Takao, Formosa; Canton, Hongkong, Amoy, Hainan, etc., China; Nagasaki and Hakodate, Japan); Bericht Senck. Naturforsch. Ges. Frankfurt, 1891, p. 271 (includes *S. javana* Marts.; Amboina group of the Moluccas; Mauritius, Ceylon, Java, Flores, Adenare, Ternate, Cebu, Mindanao).

Stenogyra striatissima Gredler, which I have included in *Prosopeas* (p. 35), should be compared with *O. javanicum*. I suspect that it is either identical or very closely related.

Reeve's figure is copied, pl. 16, fig. 88. An average Javan specimen measures, length 9.5, diam. 3.4 mm., aperture 3.2 mm., whorls 7½. The striation is very fine, crowded and thread-like, somewhat arcuate and under the compound microscope, weak spirals may be seen in unworn shells.

From Sumatra, at Batu Sangkar in the Padangsche Bovenland, specimens which I refer to *O. javanicum* were brought by Messrs. Harrison and Hiller in 1891. One is figured, pl. 16, fig. 81, the specimens being not quite full grown. The shell is imperforate or very narrowly rimate, conic-turrite, thin corneous, opaque, very densely and finely, *sharply, arcuate striate*, the striæ superficially cut by *impressed spiral lines*, which are very fine and most distinct on the penultimate whorl. Whorls 7 to 7½, moderately convex, parted by a

deeply impressed suture, the apex obtuse, smooth. Aperture narrow, the outer lip thin, arched forward near the upper insertion, retracted to the suture. Columella vertical, nearly straight, *calloused* and *obliquely truncate basally*, the columellar margin reflexed and appressed. Length 9, diam. 3.1, aperture 3.1 mm.

The oblique but distinct columellar truncation and the fine spiral striation (not readily visible with an ordinary hand lens) are prominent features of this species. Half-grown specimens have the columella as strongly truncate as the larger ones. Probably none of the lot have reached maximum size.

O. javanicum occurs also in Mauritius (pl. 23, fig. 18), attaining a larger size than elsewhere, well-grown shells being 13 mm. long, while the largest measure, length 15, diam. 4.1, aperture 4 mm., whorls 9½, or a little shorter with the same diameter. The sculpture of sharp, densely crowded striæ is the same in shells from Mauritius, Java, Sumatra and Hawaii. When unworn, the striæ bear narrow brownish cuticular laminæ.

It remains to be determined just what relation *O. javanicum* bears to *achatinaceum* Pfr. which I have placed in *Prosopeas* (p. 21), since I have not myself seen *achatinaceum*. If *javanicum* were larger it would probably be considered to be a *Prosopeas*. It has the sculpture of that group, and had I studied it fully before the monograph of *Prosopeas* was published, I would have included *javanicum* therein.

This species seems to have been mistaken for *O. clavulinum* by some authors. Mr. Sykes agrees with me in considering the following Hawaiian form a synonym.

O. henshawi Sykes. (Pl. 12, figs. 14, 16.) "Shell subperforate, turreted, somewhat solid, with closely-set, well-marked, curved, longitudinal striæ; light-yellowish horn-color. Spire well drawn out, suture well marked, but the whorls not so shouldered as in *O. junceus*. Whorls 8½, plano-convex, the last whorl inflated, and measuring about half the total length of the shell, somewhat compressed at the

base. Mouth somewhat axe-shaped, the columellar margin reflexed and rather sinuous above. Alt 12.5; diam. max. 4 mm." (*Sykes*).

Hawaii: Hilo (type loc. Henshaw) and Waipio Pali, Hamakua district (Thaanum); Oahu: Honolulu (D. Thaanum, Dr. W. H. Rush). The Bishop Museum at Honolulu has specimens from Manoa, Oahu, and from Kauai.

Opeas henshawi Sykes, Proc. Malac. Soc. Lond. VI, p. 112, f. 2 (June, 1904).

"The salient features of this form are its yellow color, the well marked, curved striæ, the size and inflation of the last whorl, and the slightly sinuous columellar margin, which bends to the left above and is not vertical. I have seen about twenty specimens, a few of which are slightly narrower in proportion to the length. This may, very possibly, be the manuscript *O. striolata* of Pease." (Sykes.)

This is quite unlike other Polynesian species by its sinuous, obliquely subtruncate columella at least in the most strongly characterized specimens, and the better developed, dense and sharp striation, which on the newest part of the shell in unrubbed individuals has a delicate cuticular lamination. The imperforate or almost imperforate axis is another characteristic feature of the shell. The larger specimen figured (pl. 12, fig. 14 from Hilo) measures length 11.5, diam. 3.75, aperture 4 mm., whorls 8. The young one figured from the same lot is 7 mm. long, both are from Hilo, the type locality of *henshawi*. A Honolulu specimen measures 12 x 4 mm.

O. kusaiense of the Carolines is a somewhat less lengthened and openly perforate species, otherwise of much the same structure. On the specimens from Hilo and some of those from Honolulu I see no spiral striation, but in a Honolulu lot collected by Dr. Rush, U. S. N., there are fine spirals on the penultimate whorl, as in the Sumatran specimens described above. It is likely that *O. javanicum* (*henshawi*) is a newcomer in the Hawaiian islands, from Java, Sumatra or some neighboring East Indian locality.

Besides the large and robust form of *javanicum* described

as *henshawi*, there is a much more slender, smaller form, which I have received from Honolulu (coll. by Thaanum), and figured on pl. 22, fig. 9. It has the typical sculpture of dense sharp striæ, which bear, when quite unworn, cuticular laminæ. Length of figured specimen 10, diam. 3 mm., whorls fully 8.

II. *West African Species.*

1. Cape Verde promontory, species no. 5.
2. Islands in the Gulf of Guinea, species no. 6 to 8.
3. Mainland of tropical W. Africa, species no. 9 to 14.

Bulimus terrulentus Morel., from Gaboon, included in *Curvella* (p. 52) may be an *Opeas* or *Pseudopeas*, but the shell is more thick-set than usual in these genera.

5. O. HANNENSIS (Rang). Pl. 15, fig. 59.

This little shell is long, conic, thin, transparent, smooth and of a slightly soiled, yellowish tint, darker towards the summit, which is somewhat obtuse. The whorls number 6, are noticeably rounded, and the last is smaller than the others taken together. The aperture is oval and nearly parallel to the axis in plane and direction. The columella is straight, and is continuous, without truncation, with the outer margin, which is sharp and simple. The animal is of a beautiful yellow color, visible by transparence through the shell. Length 4 to 5, diam. 1.5 to 2 mm. (*Rang*).

West Africa: village of Hann, Cape Verde peninsula, close to fresh water, particularly that collecting about barrels sunken in the earth (Rang).

Helix hannensis RANG, Ann. Sci. Nat. xxiv, p. 41, pl. 3, f. 8 (1831).—*Bulimus h.*, PFR., Monogr. ii, 160.—*Cf.* MORELET, Journ. de Conch. 1873, p. 239, and WOLLASTON, Testacea Atlantica, p. 510.

This species in the original locality seems to have remained unknown to subsequent naturalists. It has been reported by Morelet from the Cape Verde Is.; and Wollaston, who identified the island form with *Opeas goodalli*, reduces *hannensis* to a synonym of that form. Whether this course was

well-founded is a question which must remain unsettled until specimens from Rang's original locality can be compared.

6. O. PAUPER (Dohrn). Pl. 15, fig. 62.

Shell minutely perforate, oblong-turrited, striate, whitish-corneous, thin, diaphanous, waxy-shining. Spire turrite, the apex rather obtuse; suture impressed. Whorls 6, nearly flat, moderately increasing, the last about one-third the total length, compressed around the perforation. Aperture oblong, vertical; peristome simple, the right margin arcuate, unexpanded. Columellar margin a little expanded, reflexed. Length 6, diam. 2.5, aperture 2 x 1.5 mm. (*Dohrn*).

Prince Island: under rotten wood in a forested ravine. (Dohrn).

Stenogyra (*Opeas*) *pauper* DOHRN, Malak. Bl. xiii, 1866, p. 126, pl. 5, f. 14-16.—CROSSE, J. de Conch. 1888, p. 302.—*Bulimus p.*, PFR. Monogr. vi, p. 103.—*Opeas p.* GIRARD, Jornal, etc., iii, 1893, p. 105.

7. O. DOHRNI Girard. Pl. 15, fig. 63.

Shell turriculate, narrowly perforate, thin, diaphanous, slightly glossy, dirty yellowish, sculptured with very fine, quite regular and slightly arcuate growth striæ. Spire regularly increasing, composed of 6 or 7 quite convex whorls separated by a deep suture, and terminating in an obtuse summit. Last whorl contained 3½ times in the total length, rounded. Aperture long-oval, slightly oblique; peristome simple, acute, the margins joined by a very distinct callus; columellar margin straight, reflexed, basal margin a little effuse, outer margin noticeably arched forward. Length 8.5, diam. 2.75, aperture 2.5 x 1.25 mm. (*Girard*).

Prince Island, with *O. crossei*; St. Thome in the ravines of the Northwest coast, etc. (F. Newton).

Opeas dohrni GIRARD, Jornal, etc., iii, p. 105, pl. 1, f. 14.

It is astonishing that this species which inhabits Prince Is. and is quite common on St. Thome, has been collected only by Mr. Newton. It belongs near *O. gracile* Hutt. and *apex* Mörch. The specimens from St. Thome sometimes have the

basal lip more flaring than those of Prince Island, but this character is inconstant (*Girard*).

8. O. GREEFFI Girard. Pl. 15, figs. 64, 65.

Shell turriculate, subperforate, thin, subtransparent, a little shining, of a yellowish-white tint; sculptured with very fine, quite regular and very arcuate striæ of growth. Spire composed of 6 nearly flat whorls, separated by a suture which is not much impressed, and is slightly denticulate by the striæ; terminating in an obtuse apex. Last whorl rounded, slightly more than one-third the total length of the shell. Aperture narrow, long oval, slightly oblique. Peristome simple, acute, the margins joined by a very feeble callus; the columellar margin straight, reflexed; basal margin a little effuse; outer margin strongly arched forward. Length 6.5, diam. 2.33, aperture 2.5 x 1 mm. (*Girard*).

Prince Island, with *O. crossei*; St. Thome at Cafini (Newton).

Opeas greeffi GIRARD, Jornal, etc., p. 106, pl. 1, f. 15.

"This *Opeas* seems to be diverse from all the species now known, but approaches a new one found by Mr. Newton on Anno-Bom."

9. O. HAMONVILLEI (Dautzenberg). Pl. 15, fig. 70.

Shell narrowly perforate, long-turrited, thin, a little translucent. Spire elevated, quite attenuate at the summit, composed of 8 rather convex whorls separated by a well-marked suture. Surface ornamented with very fine longitudinal ribstriæ decussated with finer descending [spiral] lines, giving the shell when examined under a lens, a latticed appearance. Aperture oval, long; columella straight, feebly dilated and reflexed. Lip simple and acute. Uniform yellowish white. Length 11, diam. 3, aperture 3.5 x 2 mm. (*Dautz.*)

Senegambia: Bakel (Capt. Em. Dorr).

Stenogyra h., DAUTZ., Mém. Soc. Zool. France iii, 1889, p. 130, pl. 1, f. 7a, 7b.

Remarkable for its spiral striation, which however is very minute. It is more openly perforate than *O. javanicum*, and the arcuate striæ are not so strong.

10. O. ACMELLA (Morelet). Pl. 24, fig. 37.

"Shell rather small, turrited aciculate, apex a little obtuse, crystalline, smooth. Whorls 7 slightly convex, margined with a denticulate suture; the last whorl equal to one-fourth of the entire length of the shell. Aperture ovately lunate, with simple, arcuate margins, columellar margin a little dilated above, reflexed. Length 4.5, diam. 1.25 mm." (*Morelet*).

West Africa: environs of Mayomba, 120 miles N. W. of Loango.

Stenogyra acmella MORELET, Journ. de Conch. Jan. 1885, p. 26, pl. 2, f. 4.

"After *Stenogyra pusilla* from the Comoros which measures only 3 mm. in height, this species is the smallest that is known to me. The columella of this species is not truncated; the whorls of the spire, a little convex, are joined by a narrowly margined suture, where the incremental striæ, which disappear on the rest of the surface, assume the form of fine and regular folds. The shell is white, transparent and crystalline." (*Morelet*).

11. O. RECISUM (Morelet). Pl. 24, fig. 38.

Shell imperforate, shortly turrited, thin, with arcuate incised striæ, hyaline, corneous, very glossy, pale brown. Spire conoidal, apex rather obtuse. Whorls 6 plano-convex, the last enlarged, exceeding one-third of the entire length of the shell. Aperture semioval, margins simple, the columellar margin sinuous, shortly revolute above. Length 6; diam. 2.25 mm." (*Morelet*).

W. Africa: Mayomba, 120 miles N. W. of Loango.

Stenogyra recisa MORELET, Journ. de Conch. Jan. 1885, p. 28, pl. 2, f. 5.

"This little species, at first sight, recalls a little our *Ferussacia lubrica* of which it has the gloss and form. It is composed of six whorls a little convex, and the last relatively more developed, which gives it the appearance of a *Bulimus*. The aperture, in consequence, is rather large in proportion to

the size of the shell. The columella is sinuous but not truncate. Finally, the glossy, transparent shell, of a pale fawn color, is engraved with arcuate striæ, quite strongly impressed, and more apparent at the suture." (*Morelet*).

12. O. BOCAGEI Nobre. Pl. 24, fig. 34.

Shell turriculate, perforate; spire composed of 7 or 8 distinctly rounded whorls; suture quite deep, ornamented with denticulations produced by fine and nearly vertical grooves. Columella weakly arcuate, the margin reflexed over the narrowly open umbilical perforation; lip simple and a little reflexed. Color milk white with pearly reflections. Length 10, diam. 2.5 mm. (*Nobre*).

Angola: forest of Mupepe, under dry leaves. (Newton).

Opeas bocagei NOBRE, Molluscos terrestres e fluviaes da exploracao de Francisco Newton em Angola, p. 9, pl. 1, f. 15, 16, in Annaes de Sciencias Naturaes, ix, 1905.

13. O. VIEIRAI Nobre. Pl. 24, fig. 35.

Shell elongate, turriculate, perforate, thin, longitudinally striate. Spire composed of 7 or 8 much rounded whorls; suture deep. Aperture oval, lengthened; columella straight and a little bent to the left, reflexed over the umbilical cavity; lip simple and sharp. Color corneous. Length 11.5, diam. 2.75 mm. (*Nobre*).

Angola: Gumba (Newton).

Opeas vieirai NOBRE, Molluscos etc., p. 9, pl. 1, f. 17, 18, in Annaes de Sci. Nat. ix, 1905.

14. O. WELWITSCHI Nobre. Pl. 24, fig. 43.

Shell turriculate, perforate, thin, ornamented with very distinctly recurved striæ, oblique from left to right. Spire of 4 to 5 quite rounded whorls, the last forming more than half the length of the shell. Aperture rounded-oval, a little oblique; columella nearly straight, the margin reflexed over the umbilical cavity which is narrow. Color yellowish, often noticeably ferruginous. Length 7.5, diam. 3 mm. (*Nobre*).

Angola: forest of Mupepe (Newton).

Opeas welwitschi Nobre, Mollucos etc., p. 10, pl. 1, f. 19, 20, in Annaes de Sci. Nat. ix, 1905.

Three examples from Luinha are of a greenish color. In some examples there is a very narrow band at the suture.

III. *East African Species.*

15. Opeas bawriense n. n. Pl. 15, fig. 66.

Shell slender, diaphanous, nearly smooth, glossy. Whorls 7, rather flattened, gradually increasing, the last larger and more swollen. Apex rather obtuse. Aperture ovate-elliptical, lip arcuate; columella a little reflexed. Length 5.5, diam. 2 mm. (*Gibbons*).

Bawri Island, Zanzibar (Gibbons).

Stenogyra lucida Gibbons, Journal of Conchology ii, p. 144, pl. 1, fig. 4, May, 1879. Not *Achatina lucida* Poey, 1851, also an *Opeas*.

"Allied to *S. delicata* [*Curvella delicata*], but perfectly distinct, being much smaller with the whorls flatter and nearly smooth, and the aperture less elongated."

16. O. crenulatum E. A. Smith. Pl. 15, fig. 67.

Shell slender, subulate, pellucid, glossy, thin, whorls 12, slowly increasing, the two apical smooth, convex, the rest a little convex, obliquely lightly striatulate, at the suture minutely crenulate; separated by a slightly oblique suture, the last whorl short. Aperture inversely ear-shaped, small; peristome thin, the columellar margin expanded and reflexed. Length 12, diam. 3, aperture 2¼ mm. long. (*Smith*).

British East Africa, near the terminus of the Uganda R. R. between Sept. 1900 and April, 1901 (Wm. Doherty).

Opeas crenulata Smith, Journ. of Malacology viii, p. 96, fig. 6 (Dec. 30, 1901).

"Well characterized by the numerous short whorls and the minute plication at the suture. The form is somewhat variable, some specimens being more slender than others."

17. O. venustum E. A. Smith. Pl. 15, figs. 69.

Shell long, slender, pellucid, glossy, slightly striate.

Whorls 10, very slowly increasing, the first two globose, the rest a little convex, the last short. Aperture small, inversely ear-shaped; peristome thin, the right margin arcuate, columellar margin dilated and reflexed at the insertion. Length 9, diam. 1.5, aperture 1 x 0.75 mm. (*Smith*).

Eastern Uganda (Wm. Doherty).

Opeas venusta SMITH, Journ. of Conch. x, p. 319, pl. 4, f. 21, April 1, 1903.

"More slender and smaller than *O. crenulata* Smith from the same locality, and without any crenulations beneath the suture. The increase of the whorls is very gradual and there is scarcely any difference in the height of the last five whorls."

18. O. LENTUM E. A. Smith. Pl. 15, fig. 68.

Shell long, slender, thin, pellucid, glossy, obliquely closely and very finely striate. Whorls 10, slowly increasing, the first two smooth, convex, the rest a little convex, separated by a rather deep oblique suture, the last scarcely descending. Aperture small, inversely ear-shaped, lip thin, lightly and very narrowly expanded; columella expanded and convexly reflexed. Length 10, diam. 2.75, aperture 2 x 1.5 mm. (*Smith*).

Eastern Uganda (Doherty).

Opeas lenta SMITH, Journ. of Conch. x, p. 319, pl. 4, f. 20, April 1, 1903.

"The raised striæ are very slender, closely packed, thread-like and oblique. Two or three at distant intervals, former labra, are more conspicuous than the rest."

19. O. STENOSTOMUM (E. A. Smith). Pl. 15, fig. 71.

Shell narrowly rimate, elongate, slender, tapering above, at the apex obtuse, rounded; glossy somewhat greenish-pellucid. Whorls 8, slightly convex, sculptured with arcuate growth-striæ, separated by an oblique suture; the last whorl elongate, cylindric. Aperture elongate, narrow, about two-sevenths the total length; lip thin, curved forward; columella nearly vertical, narrowly expanded and reflexed. Length 10.5, diam. 3, aperture 3 x 1.5 mm. (*Smith*).

British East Africa: Mamboya, at an elevation of 4-5000 ft. (Last).

Stenogyra (*Opeas*) *stenostoma* SMITH, Ann. and Mag. N. H. (6), vi, p. 160, pl. 5, f. 20. August, 1890.

"This species has a long body-whorl and aperture, recalling to mind the little *Cecilianella acicula*."

20. O. LIMPIDUM Martens. Pl. 15, fig. 72.

Imperforate, conic-turrited, weakly and closely striate, translucent, glossy, of glassy clearness. Whorls 9 to 9½, the first globular, smooth, the second and third of nearly equal size, strongly convex, the following regularly and slowly increasing, convex, with rather impressed whitish sutures, the last whorl rounded below. Aperture rather oblique, rounded-squarish, comprising a little more than one-fourth the length of the shell; outer lip thin, scarcely arcuate; lower margin rather narrowly rounded, columellar margin vertical, rather thick, white, narrowed below, and forming a distinct angle with the basal margin. Length 11, diam. 3, aperture 2.66 x 1.75 mm. (*Marts.*).

East Africa: Bukende on the Issango (Dr. Stuhlmann).

Opeas limpidum MARTS., Beschalte Weichthiere p. 127, pl. 5, f. 31.

"Reminds one of *Streptostele* by the shape and luster of the shell, but the columellar margin is not so distinctly twisted and the outer lip is not thickened." The imperforate axis is unusual in *Opeas*, if the species really belongs here.

21. O. STREPTOSTELOIDES Martens. Pl. 15, fig. 73.

Elongated-conic, with an umbilical fissure, closely rib-striate, with a yellowish-brown cuticle, in part deciduous; very obtuse above. Whorls 6½, scarcely convex, with a rather deep suture, regularly increasing, the last rounded, convex below. Aperture occupying one-fourth the total length, of a rounded obliquely quadragular shape; peristome unexpanded, the outer margin nearly vertical, receding above; basal margin rounded; columellar margin vertical, thickened above, and obliquely entering the interior of the

aperture, but spreading outwardly in a broad and distinctly defined deposit. Length 9, diam. 3, aperture 2.25 x 1.75 mm. (*Marts.*).

Uganda: Buddu coast, in the shore forest (Emin Pasha, Stuhlmann).

Opeas s., MARTS., Beschalte Weich. p. 127, pl. 5, f. 30.

"The shape of the mouth reminds one of Streptostele, but the columellar margin is less spirally twisted, the outer lip is not thickened and the surface of the shell is not smooth and glossy. The young shells of *Streptostele costulata* are distinctly more slender than this snail."

IV. *South African Species.*

22. O. CRAWFORDI (Melvill & Ponsonby). Pl. 15, fig. 74.

Shell very thin, glassy, tapering, cylindric, whorls 5, smooth, ventricose, longitudinally very delicately striatulate under the lens; last whorl produced. Aperture oblong; peristome simple, unexpanded; columellar margin a little thickened. Largest specimen, length 4.5, diam. 1.5 mm. (*M. & P.*)

South Africa: Van Staaden's River (J. Crawford, Esq.).

Stenogyra crawfordi M. & P., Ann. and Mag. N. H. (6) xii, p. 105, pl. 3, f. 4 (Aug. 1893).

"A smoothish glossy species, to which we cannot assign a place as the young of any South African form with which we are acquainted, several of the specimens before us being apparently full-grown."

23. O. DURBANENSE Sturany. Pl. 15, figs. 75, 76.

The conic shell, composed of 6½ whorls, is more or less gradate; it is translucent, slightly glossy, and of a greenish color, with obtuse apex and a quite weak thread-like suture. Only the most delicate growth-striæ are visible under the lens. The columellar margin of the peristome is somewhat reflexed, leaving only an inconsiderable umbilical crevice. Length 8.7, diam. 3.3, length of the aperture 3.5, width 1.7 mm. (*Sturany*).

Natal: Durban (Dr. Penther).

Opeas durbanense STURANY, Anzeiger K. Akad. Wissensch. Wien, 1898, p. 7; Denkschr. K. Akad. Wissensch. lxvii, p. 597, pl. 2, f. 42-44 (1899).

A single specimen taken. It seems to be related to *O. crawfordi* M. & P.

24. O. STRIGILIS Melvill & Ponsonby. Pl. 15, fig. 79.

Shell minute, rimate, very slender, tapering-fusiform, crystalline, of a silvery golden straw color. Whorls 8, the apical one nearly immersed, obtuse, the rest delicately and very closely obliquely striate, last whorl lengthened. Aperture narrowly ovate; peristome thin, the columellar margin reflexed. Length 7.25, diam. 2 mm. (*P. & M.*).

Natal: Karkloof Bush, near Pietermaritzburg (J. McBean).

Subulina strigilis M. & P., Ann. and Mag. N. H. (7), viii, p. 318, pl. 2, f. 7 (Oct. 1901).

"A beautifully striate species, of which we have seen four examples, slightly varying in size, but in all other respects uniformly alike" (*M. & P.*).

25. O. TUGELENSIS (Melvill & Ponsonby). Pl. 15, fig. 78.

Shell attenuate, fusiform, pellucid, rather delicate, very thin, milk-white. Whorls 7, the apical very obtuse, papillate, the rest rather swollen, smooth, the last produced. Aperture oblong, peristome thin, simple; columellar margin straight. Length 14, diam. 4 mm. (*M. & P.*).

Natal: Lower Tugela River.

Subulina tugelensis M. & P., Ann. and Mag. N. H. (6), xix, p. 637, pl. 17, f. 9 (June, 1897).

"An interesting form, more glossy than most of the hitherto recognized South African species, of a beautiful translucent milky-white color."

26. O. MCBEANI Melvill & Ponsonby. Pl. 15, fig. 77.

Shell tapering, fusiform, delicate, subpellucid, pale straw colored, whorls 10, the two apical mamillar, the rest impressed at the sutures, rather tumid, longitudinally minutely oblique-striate throughout. Aperture small, the lip thin,

columellar margin nearly straight, a little thickened, glossy, white. Length 9.5, diam. 2 mm. (*M. & P.*).

Transvaal: Boksberg (Burnup).

Opeas mcbeani M. & P., Ann. and Mag. N. H. (7), xii, p. 604, pl. 31, f. 8 (Dec. 1903).

"Differs from its near ally *Subulina strigilis* M. & P. in its more globular apical whorls, finer striation and smaller aperture. In that species, too, the last whorl is not so prolonged proportionately, and the upper whorls are less ventricose than in this new form." Compare *O. gracile*.

V. *Opeas of the Comoros, Seychelles, Mauritius, etc.*

The Comoro Is. have a rich and peculiar Stenogyrine fauna of African type, indicative of long isolation. The faunal history of these islands has had nothing in common with the Mascarene and other islands of the region.

The Mascarene islands owe their *Stenogyrinæ* chiefly if not wholly to importation, probably since the period of settlement. Their position as ports of call between the East and Europe early brought in Oriental *Opeas,* a number of which were first described from Mauritius, etc. Any Mascarene *Opeas* may be expected to turn up in the East; and the original center of dispersal of such forms as *O. mauritianum, clavulinum, gracile* and *javanicum* may never be known, though it was doubtless somewhere in the East Indies or southeast Asia.

The American species *O. goodalli, O. swiftianum* and *O. micra* occur as immigrants, the former reported from Rodriguez, the two latter sent by Nevill from Mauritius.

27. O. APICULUM Morelet. Pl. 23, figs. 12, 13.

"Shell turrited subulate, thin, closely striate, the earlier whorls costulate-striate; horny reddish, not shining. Spire elongate, the apex rather acute. Whorls 8, planulate, the last equal to one-third of the entire length of the shell. Columella slightly receding, hardly truncate. Aperture of medium size, semioval. Peristome simple, acute, unexpanded. Length 12, diam. 3 mm." (*Morelet*).

Comoro Is.: Grand Comoro (*Humblot*).

Stenogyra (*Opeas*) *apiculum* MORELET, Journ. de Conchyl. Oct. 1885, p. 292, pl. 14, f. 10.

"A small shell of the same group as the preceding (*S. longula*), of which it reproduces almost exactly the characters. It is equally subulate, with the whorls of the spire flattened, eight in number, instead of nine as in its congener. Its aperture is relatively not so long, and its columella less twisted. Moreover, it is engraved with strong striæ which assume the appearance of a costulation on the earlier whorls of the spire. It is impossible to confound it with the young of the *S. longula*. (*Morelet*).

The shell is *without trace of umbilical perforation*, and is olivaceous-yellow rather than "*corneorufa*." The apex is obtuse, side-slopes just perceptibly convex. The first 2⅓ whorls are smooth, then striæ set in, which become coarser, so that *the intermediate whorls are irregularly costulate*. The last whorl or two are rather finely, irregularly striate. All the whorls but the first one are decidedly flattened. The piriform aperture is quite oblique, the thin outer lip is arched forward a little near the upper insertion. The columella is oblique, its lower, callous portion being very obliquely excised below. The reflexed edge is thin and closely adherent. The largest specimen I have seen measures, length 12.5, diam. 3.7, aperture 3.9 mm., and has 8 whorls.

28. O. LONGULUM (Morelet). Pl. 15, fig. 80.

"Shell subulately turrited, rather thin, irregularly hair-striate, corneus brown, a little shining. Spire elongate, apex rather acute. Suture impressed. Whorls 9 planulate, the last hardly exceeding one-third of the entire length of the shell. Columella twisted, receding, not truncate. Aperture elongate, not very wide, base subeffuse; peristome thin. Length 19 diam. 5 mm." (*Morelet*).

Comoro Is.: Grand Comoro. (Humblot.)

Stenogyra (*Opeas*) *longula* MORELET, Journ. de Conchyl. Oct. 1885, p. 292, pl. 14, f. 9.

"This Stenogyra, with a spire composed of nine depressed

whorls, separated by a very distinct suture, is elongated in the form of an awl. The striæ with which it is engraved from about the fourth whorl, are very irregular. The epidermis is of a uniform brown color without gloss. The long and narrow aperture is slightly effuse at the base. The columella is not truncated, but it is a little twisted spirally." (*Morelet*).

29. O. AVENACEUM (Morelet). Pl. 16, figs. 86, 87.

"Shell imperforate, oblong, thin, somewhat glossy, smooth, brownish-waxen; whorls 7 a little convex, the last equal to three-sevenths the entire length of the shell. Columella straight, obliquely truncate, not reaching the base. Aperture semi-oval, margins simple unexpanded. Length 7 diam. 2½ mm." (*Morelet*).

Comoro Islands: Mayotte (Marie).

Stenogyra avenacea MORELET Jour. de Conch. xxix, July, 1881, p. 219, pl. 9, f. 3.

"It is distinguished from *S. johannina*, which is much more shining, by being imperforate; from *gracilis* and *clavulina* by the truncate columella; from *mauritiana* (a doubtful form) by the two preceding characters and its absolutely smooth surface. The other species of the same group are much larger. The columella, in this shell, is obliquely truncate before reaching the base; the aperture forming a round shallow sinus below the truncation." (*Morelet*).

The specimen drawn in fig. 86 is from E. Marie. I am entirely inclined to place this shell in *Opeas*. The oblique truncation of the columella is not greater than in *O. layardi* and some other species. The very fine *growth-striæ are almost straight*, not distinctly arcuate as in *Opeas* generally.

30. O. JOHANNINUM (Morelet). Pl. 23, figs. 16, 20.

"Shell subimperforate, turrited, rather solid, arcuately hair-striate, shining, diaphanous, white or pale yellow, in specimens a long time dead, waxen; spire elongate, conic, somewhat acute, whorls 7½, slightly convex, the last equal to two-fifths the length of the shell; columella almost vertical, gradu-

ally tapering; aperture oblong, base rotund, peristome simple, unexpanded, exterior margin evenly arcuate, columellar margin narrowly reflexed. Length 10-11, diam, 4-4½ mm. Length of aperture 4, breadth 2 mm." (*Morelet*).

Comoro Islands: Johanna (Anjuan) (Bewsher) and Mayotte (Marie). Also Nossicumba (Marie), and Nossi-Be (Stumpff).

Bulimus (*Stenogyra*) *johanninus* Morelet, Journ. de Conch., Oct. 1877, p. 333, pl. 12, f. 3.—*Opeas johanninus* (Mor.) Boettger, Nachrbl. 1890, p. 90.—Crosse, Journ. de Conch. July, 1881, p. 201.—*Stenogyra johannina* Morelet, Journ. de Conch. July, 1881, p. 219; J. de C. Oct. 1885, p. 293.—*O. johanninus* Crosse & Fischer in Grandidier, Hist. Phys. Nat. et Politique de Madagascar, 1889, xxv, pl. 24, f. 2.

Morelet writes as follows: It differs from *B. mauritianus* Pfr., known to me only by the description and figure, in the height, the texture of the shell, by the fullness of the whorls of the spire which gives it a more bulimoid form, the aperture is also a little wider, and the apex more obtuse. *B. johanninus* is distinguished by a quite swollen spire, of which the last two whorls are longer than the rest of the shell. It is found in great abundance in dry places on the shore. The specimens collected at Mayotte by E. Marie are more slender and do not exceed 6 x 3 mm. Boettger, writing of Nossi-Be specimens, says that the species belongs to the immediate group of *O. clavulinus* P. & M., but is sharply distinguished from that by the greater size, more conic shape, more rapidly increasing whorls, and especially by the relatively much higher aperture. But the *O. clavulinus* of Boettger is evidently not the species so identified by von Martens and the writer, but apparently is *O. javanicum* (Rve.).

The specimens before me from Nossi-Be (pl. 23, fig. 20), received from E. Marie, are evidently related to *O. mauritianum,* but are more conic, and differ by having a sculpture which in places may be termed closely, irregularly, arcuate-striate; but elsewhere would be better described as closely but irregularly grooved. The sculpture is much less dense than in *O. javanicum.* The larger shells measure, length

10.3, diam. 3.9, aperture 3.9 mm., whorls 7. They have the usual clear corneous color.

Var. MAYOTTENSE nov. Pl. 23, fig. 19.

Shell openly perforate, clear whitish-corneous, very thin. Sculpture of fine striæ and grooves, the post-embryonic whorls being very regularly grooved. Length 7, diam. 2.3 mm., whorls 7.

Comoros: Mayotte (E. Marie).

This form is very similar to *O. clavulinum,* but differs by the regular and stronger sculpture of the spire. It is much smaller than *O. johanninum* and less conic. Some of the specimens contain eggs.

31. O. VULGARE (Morelet). Pl. 23, fig. 14.

"Shell rimate, turrited, rather thin, arcuately hair-striate, shining, diaphanous, pale corneous; apex somewhat obtuse. Whorls 8, a little convex, the last more dilated, nearly equal to one-third the length. Columella nearly straight, entire. Aperture truncate-oblong, columellar margin longitudinally dilated, reflexed. Length 8, diam. 4½ mm." (*Morelet*).

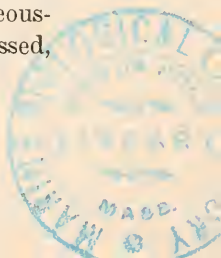
Comoro Islands: Anjuan (Humblot.)

Stenogyra vulgaris MORELET, Journ. de Conch. xxxv, Oct. 1887, p. 286, pl. 9, f. 4.

According to Morelet, this species resembles *S. octona, S. cereola* and *S. simpularia.* The resemblance to *S. octona* is superficial, but the columella in *vulgaris* is not truncate. In *S. simpularia* and *cereola* the columella is also truncate, though very obliquely so, but these two are larger, more deeply colored and decidedly less strongly striate. It seems to be closely related to *O. johanninum,* from the same island, yet differs by its much greater width. I have not seen specimens.

32. O. SPINULA (Morelet). Pl. 23, fig. 15.

"Shell small, arcuately rimate, turrited, apex tapering, shining; very finely costulately-striate, translucent, corneous-whitish. Whorls 7, rather convex, joined by an impressed,



narrowly margined suture, the last whorl compressed about the umbilical rimation, exceeding one-third of the entire length of the shell. Aperture oblong, external margin simple, unexpanded, columellar margin dilated, reflexed. Length 5½, diam. 2 mm." (*Morelet*).

Comoro Is.: Mayotte (*Marie*).

Stenogyra spinula MORELET, Journ. de Conch., July, 1883, p. 194, pl. 8, f. 10.

"Among those which live on the islands of East Africa and on the neighboring continent, *Stenogyra clavulina, S. johannina,* as well as the young individuals of *S. clavulus,* are the only ones which approach the present species. But it is distinguished from the first two by the more acicular form, the last whorl being decidedly less inflated, whilst the spire is more elongated; by its sutural margin, and finally by the columella being more broadly dilated. As to the young specimens of *S. clavulus*, they have six whorls in the spire, instead of seven, when they are the same size, and the last whorl, as in the preceding, is more developed. The shell, moreover, is more solid, less glossy, less transparent, and the suture is not margined. The species really differs therefore from all others found in the same region." (*Morelet*).

33. O. BRAUERI (Martens). Pl. 12, fig. 15.

A very small snail, 4.5 mm. long, last whorl 1.5 mm. wide below, aperture 1.5 mm. long; yellowish-white, with nearly vertical striæ, convex forwardly; not glossy. Whorls 5½, rather rapidly but regularly increasing, with impressed suture, the first forming an obtuse apex, which however is not thickened into a head as in *Elma.* Aperture long, pear-shaped, very acutely angular above, narrowly rounded below. Outer lip simple, thin, steeply rising, convex forwardly, and under the suture noticeably retracted. Columellar margin vertical, thick, passing into the basal margin in a short bend without emargination, leaving a narrow umbilical slit behind it. (*Martens*).

Seychelles: Mahe, at Anse aux Pins, on cocoanut planted strand.

Hapalus braueri MARTENS, Mittheil, aus der Zoolog. Sammlung des Mus. f. Naturkunde in Berlin, i, p. 24, pl. 2, f. 18.

Resembles *Acicula mauritiana* H. Ad., in size and form, but in that the penult. whorl is comparatively longer, and separated from the last whorl by a deeper suture. The reference of this species to *Hapalus* seems to me of very doubtful expediency. It may be related to *O. goodalli*; and indeed I cannot readily see how it differs from that widely-spread species.

34. O. SWIFTIANUM (Pfeiffer). Pl. 23, fig. 26.

Shell *very slender, imperforate,* thin, yellowish-corneous, glossy, *very weakly* sculptured with faint growth-wrinkles which are nearly straight. Spire slender, with straight outlines and obtuse apex. Whorls 7½, moderately convex; suture impressed, even, a narrow border below it slightly puckered. Aperture small, ovate, the columella a little calloused, very slightly excised below, and at the insertion above it curves to the right. Length 7.8 diam. 2, length of aperture 2 mm.

Mauritius (Nevill); introduced from the West Indies.

This form is more slender than *O. gracile* and much smoother, and is imperforate, the columellar reflection being closely appressed. The suture is not crenulate.

VI. *Species of Ceylon, India and Southeastern Asia.*

Opeas gracile, O mauritianum and probably some other of the widely spread forms, occur in Ceylon, the former also in India, east to Tonkin. Nevill, in his Handlist Ind. Mus. i, p. 165, lists "*Stenogyra* (*Opeas*) *nevilli* G. Ad." from the Dafla Hills. It is undescribed and unknown to me.

35. O. SYKESI n. sp. Pl. 21, fig. 1, 2.

Shell perforate, resembling *O. gracile* in sculpture but with the *whorls much shorter*, more compactly coiled, more numerous in shells of the same length. Spire straightly and regularly tapering to the small apex. Whorls 8½ to 10, the embryonic 1½ smooth except for a minute subsutural radial

striation, which becoming stronger on the post-embryonic whorls produces a fine, irregularly developed crenulation of the suture, the latter becoming smooth again lower down. Later whorls somewhat flattened. Suture well impressed. Aperture vertical, *much shorter than in O. gracile*; outer lip weakly arcuate, a little arched forward; basal margin well arched; columella rather straightened, the edge reflexed.

Length 11, diam. 3.4, aperture 2.9 mm.; whorls 8½.

Length 12.9, diam. 3.5, aperture 3.1 mm.; whorls 10.

Ceylon. Types no. 58330 A. N. S. P.

This form is readily selected from among *O. gracile* by its short whorls and small, wider mouth, with a deep bay where the columella joins the parietal wall. I do not see, in the great number of *O. gracile* before me, any approach to this form. Named for Mr. E. R. Sykes of London.

36. O. LAYARDI (Benson). Pl. 4, figs. 19, 20; pl. 16, figs. 82, 83.

Shell imperforate, elongate-turrited, thin, arcuately striatulate, whitish, covered with a thin, corneous epidermis. Spire elongated, the apex obtuse, suture somewhat deep, occasionally eroded-denticulate. Whorls 7½, convex, the last impressed behind the columella. Aperture oblique, long-ovate, narrow above; peristome thin, acute; lip arcuate, the columellar margin thickened, moderately twisted. Length 12.5, diam. 4 mm.; length of aperture 4, diam. scarcely 2 mm. (*Bens.*).

Ceylon: Moopana, Bootelle, etc. (Layard).

Spiraxis layardi BENS., Ann. Mag. Nat. Hist. (3 ser.), ix, p. 90, 1863.—PFR., Monogr., vi, p. 190.—HANLEY & THEOB., Conch. Indica, pl. 79, f. 2, 3.

This is a form of somewhat uncertain relationships. The subtruncate, calloused columella recalls *Tortaxis*, yet the delicacy of the shell, its small apex, and the oviparous reproduction, are characters of *Opeas*. It is probably related to *O. avenacea* Morel., *javanicum* Rve., etc., which have the columella similarly truncate.

Shell is pale yellowish-corneous, more or less transparent, very glossy, with weak sculpture of arcuate growth-wrinkles.

Old shells (fig. 83) become opaque; the upper whorls are eroded, and the cuticle is liable to fungoid attack which erodes it in dots, often at the suture. When fully adult the shell is imperforate and measures, length 11, diam. 4, length of aperture 4 mm., whorls 7½. Specimens of 8½ mm. length, rimate and with obviously immature peristome, often contain numerous eggs. The figures on pl. 4 are from the *Conchologica Indica*. On plate 16, figs. 82, 83, one of the specimens received from Nevill is drawn.

37. O. MARIÆ Jousseaume. Pl. 19, fig. 21.

Shell subperforate, long-turrited, rather solid, opaque, arcuately striate, white, with a yellowish-white cuticle, slightly glossy. Spire long, the apex obtuse, suture immersed, crenulate. Whorls 8, a little convex, the last four-ninths the total length. Aperture oblong-oval, obliquely truncate above; peristome simple, acute, the right margin depressed above, nearly straight, columellar margin widely dilated and reflexed, partly bounding the perforation. Length 9, diam. 2 mm. (*Jouss.*).

Ceylon: Kandy (E. Simon), one specimen.

Opeas mariæ JOUSS., Mém. Soc. Zool. France vii, 1890, p. 290, pl. 4, f. 9.

Unknown to me. Sykes suggests that it may be *O. gracile*.

38. O. CARINATUM (Wattebled). Pl. 19, fig. 19.

Shell imperforate, very minute, conic-elongate, the apex acute; subpellucid, pale tawny. Whorls 6, a little convex, gradually increasing. Suture well marked, bordered above by a fine carina which is stronger on the middle of the last whorl where it becomes visible to the naked eye. Aperture subquadrate; peristome simple, unexpanded and acute, the columellar margin arcuate, outer margin angular. Length 3, diam. 0.75 mm. (*Wattebled*).

Cochin-China: Long-Xuyen. (Capt. Dorr).

Stenogyra carinata WATTEBL., Journ. de Conch. 1884, p. 125, pl. 6, f. 1.

A very small form differing from all other *Opeas* known by

its peripheral keel. The imperforate axis also is unusual in this genus, to which the species is referred with some doubt.

39. O. FAGOTI Mabille.

Shell high-subpyramidal. Slender, thin, rather fragile, subpellucid, pale buff, rather glossy, ornamented with dense, arcuate, subcostulate striæ. Spire long, acuminate, the apex obtuse, mamillate, glossy, smooth. Whorls 10, gradually and regularly increasing, separated by an impressed, very minutely tuberculate suture; the last whorl larger, nearly one-third the total length, slowly descending to the aperture, compressed basally. Aperture vertical, oblique, narrowed; columella slightly arcuate, a little thickened, reaching to the base of the aperture; peristome thin, unexpanded; margins joined by a very thin callus, forming an inconspicuous umbilical crevice. Outer margin slightly attenuate. Length 21, diam. 6 mm. (*Mabille*).

Tonkin (Balansa).

Opeas fagoti MAB., Moll. Tonk. Diagn. p. 10 (May 14, 1887; Bull. Soc. Mal. France iv, p. 106.

This unfigured species may be a *Prosopeas*.

40. O. HEDEIUM Mabille.

Shell minute, perforate, long-turrite, thin, fragile, corneous, slightly shining, densely arcuately hair-striate; apex minute, glossy, rather acute. Whorls 9, gradually and regularly increasing, a little convex, separated by an impressed, obscurely marginate and very minutely granulate suture, the last whorl subcylindric, inflated, scarcely one-third the length of the shell, a little descending to the aperture. Aperture vertical, roundly arcuate at the base; columella subarcuate, a little thickened, calloused, extending to the base; outer margin nearly straight, columellar dilated, half covering the perforation. Length 15, diam. 3 mm. (*Mabille*).

Tonkin (Balansa).

Opeas hedeius MABILLE, Moll. Tonk. diagn., p. 11, 14 May, 1887; Bull. Soc. Mal. France iv, p. 105. — *Opeas hedenes* Mabille, FISCHER, Catal. et Dist. Geogr. des Moll. terr. etc.

d'un partie de l'Indo-Chine, p. 36; in Bull. Soc. d'Hist. Nat. d'Autun iv, 1891.

Perhaps this is a well-developed form of *O. gracile,* from which it seems to differ in being longer and more slender. It has not been figured.

41. O. FILIFORME Moellendorff. Pl. 19, fig. 22.

Shell rimate, very slenderly turrite, thin, finely and very closely striatulate, glossy, pellucid, whitish; spire gradually tapering, the apex a little obtuse. Whorls 7½, a little convex, slowly increasing, separated by a rather impressed suture. Aperture moderately oblique, narrowly acuminate-oval; peristome unexpanded, acute; columellar margin a little thickened, reflexed. Length 5.5, diam. 1.5 mm. (*Mlldff.*)

Samui Is., Gulf of Siam. (C. Roebelen).

Opeas filiforme MLLDFF., Proc. Zool. Soc. Lond. 1894, p. 15, pl. 16, f. 11.

"I do not know of any similar small and slender species of *Opeas.* The comparatively great number of whorls shows that it is adult."

42. O. DIDYMA (Westerlund). Pl. 19, fig. 13.

Shell rimate, subulate, closely, finely striate, the striæ curved outwardly, vitreous, rather glossy, the apex obtuse. Whorls 7½, the upper convex, the first subcylindric, the rest a little convex, all rather truncate above, separated by a deep, margined, crenulate suture which is horizontal above, then oblique. Aperture subtrigonal-piriform, obtuse at base, the slightly oblique parietal wall forming a deep angle with the columella; columellar margin nearly straight, not truncate at base, reflexed, nearly closing the perforation; right margin lightly curved. Length scarcely 8, diam. 2.5 mm. (*West.*)

Singapore (Vega Exped.).

Stenogyra didyma WESTERL., Vega-Expeditionens Vetenskaplige Arbeten, iv, p. 197, pl. 3, f. 9 (1887); Nachrbl. 1883, p. 51.

43. O. LATEBRICOLA ('Bens.' Reeve). Pl. 19, figs. 20, 23.

"Shell acuminately oblong, compressly umbilicated, whorls 6 in number, somewhat rounded, smooth or concentrically striated; transparent straw-color, polished. A very delicately colored, transparent species." (*Rve.*)

Shell subperforate, turrite-oblong, rather thin, striatulate, slightly shining, diaphanous, whitish straw-colored. Spire turrited, the apex rather obtuse. Whorls 6 to 6½, slightly convex, the last a little more than one-third the total length, rounded at base; columella somewhat straightened, vertical. Aperture vertical, oblong; peristome simple, unexpanded, the margins subparallel, columellar margin narrowly reflexed. Length 7.33, diam. 3 mm., aperture 2.66 x 1.66 mm. (*Pfr.*, from specimen in Coll. Benson).

Western Himalayas: Landour, 4-7000 ft. elevation.

Bulimus latebricola Bens., REEVE, Conch. Icon. v, pl. 80, f. 572 (Dec. 1849).—PFR., Conchyl. Cab. p. 74, pl. 20, f. 5, 6; Monogr. iii, p. 401.—HANLEY & THEOBALD, Conch. Indica, p. 34, pl. 79, f. 7.

Reeve's original figure is copied, fig. 23; also that of Hanley, fig. 20. The species is not known to me by specimens. It seems to be related to *O. clavulinum*, or perhaps *O. layardi*, with which Nevill associates it, Handlist Ind. Mus.

VII. *Chinese Species.*

The material is not extant, outside of the collections of Heude and Gredler, for a revision of Chinese *Opeas*. That part of the species are identical with those described from other regions is probable: and moreover it seems unlikely that so many distinct species exist. They are illustrated on plates 19 and 20.

Opeas gracile is common in at least part of the ports of China. *Achatina chinensis* Pfr., which I have provisionally placed in *Tortaxis* (p. 6), may be an *Opeas* related to *layardi* or *javanicum*. *Bulimus decorticatus* Reeve, *B. fortunei* Pfr. (see p. 34, 35) may also belong to *Opeas*. *O. pyrgula* S. & B. (no. 71) has been reported from China. Prob-

ably *O. clavulinum* will be found to include some of the described forms.

44. O. SCHENSIENSE Sturany. Pl. 19, fig. 18.

The turrited, yellowish-white shell with nipple-like apex consists of 7½ convex, delicately transversely striate whorls. The umbilicus is crevice-like. Length 6.4, diam. 2.1, aperture 1.8 x 1.2 mm. (*Sturany*).

China: Southwestern Shen-si, in loess of the left bank of the Tung-ho river (Obrutschew).

Opeas schensiense STURANY, Denksch. Kais. Akad. Wissensch., Wien., lx, 1901, p. 37, pl. 3, f. 10.

O. fauvelianum and *O. filare* Hde. are related forms.

45. O. AMDOANUM Moellendorff.

Shell minutely rimate, very slenderly turrited, thin, closely striatulate, pale straw-colored. Spire much lengthened, very slender, regularly tapering. Whorls 12½, flattened, somewhat terraced, somewhat angulate at the margined, subcrenulate suture. Aperture narrowly oval, moderately excised; peristome unexpanded, acute, the columellar margin shortly reflexed, nearly closing the umbilical crevice. Length 11.5, diam. 2.1 mm. (*Mlldff.*)

China: province Gan-su, between Yu-linguan and Wen-hsien; Dshie-dshou.

Opeas amdoanum MLLDFF., Annuaire du Musée Zoologique de l'Acad. Imp. Sci. de St. Pétersb., vi, 1901, p. 390.

"No similar slender and acute species is known to me, and there is none closely related among Heude's species."

46. O. TURGIDUM (Gredler). Pl. 20, figs. 29, 30, 31.

Shell subperforate, turrited or conic-fusiform, thin, lightly rugulose-striate, the striæ arching forward, evanescent above, glossy, waxen. Apex obtuse. Whorls 7½, convex, the suture rather deep, last whorl rounded below, one-third the total length. Aperture subvertical, narrowly piriform; columella subarcuate, vertical, scarcely truncate; columellar margin dilated and reflexed above, adnate, gradually taper-

ing downwards, not truncate; right margin arching forward, joined to the columellar by a very delicate callus. Length 9, diam. 3 mm. (*Gredl.*).

China: Western Yun-tcheu-fu, southern Hunan (Gredler).

Stenogyra turgida Gredler, Jahrb. d. D. Malak. Ges. viii, 1881, p. 21, pl. 1, f. 3.—Heude, Mémoires p. 57, pl. 20, f. 22. —*Opeas clavulina* P. & M., Gredler, Malak. Bl. n. F. ix, p. 142.

In a later list (1887) Gredler considered his species to be a synonym of *O. clavulinum*, with which Dr. Boettger identified it; but in Nachrbl. 1890, p. 153, he again allows it to stand as a species. The original figure is copied in my fig. 31, Heude gives more enlarged views, copied on plate 20, figs. 29, 30.

47. O. nutans (Gredler). Pl. 20, fig. 32.

Whorls 10½, while even the large Chinese species such as *erecta* Bs. and *mandarina* Pfr. have but 8. The putative novelty is moreover remarkable for its small diameter, excepting the rather inflated and high last whorl, 5 mm. in diam., while the visible part of the penult. whorl measures only 3 mm. The somewhat bent axis may well be individual and abnormal.

China: western part of the district Yun-tcheu fu.

Stenogyra (spec. nov. ?), Gredler, Jahrb. d. D. Malak. Ges. viii, 1881, p. 22, pl. 1, f. 4.—*Stenogyra nutans* Gredl., Nachrbl. 1890, p. 153.—*Stenogyra (Opeas) nutans* Gredl. var. *macra* Gredler, Zur Conchylien-Fauna von China, xvii Stück, Wien, 1892, p. 7.

Var. *macra* Gredler. The shell is distinctly narrower, suture more oblique, and the length greater. Alt. 19.5, diam. 4 mm.

48. O. gracilius (Gredler). Pl. 20, fig. 33.

Shell slightly rimate, very slenderly subulate, thin, irregularly and closely wrinkle-striatulate, the striæ arching forward, disappearing above; hyaline, rather glossy, the apex obtuse. Whorls 8, a little convex, slowly increasing, the last

rounded at the base. Aperture slightly oblique, small, long-oval; columellar margin lightly arcuate, a little dilated, not truncate. Length 8, diam. 1.66, aperture 1.75 mm. long. (*Gredl.*).

China: Hunan, very likely on the Ape Mountain (Fuchs); Kuang-si.

Stenogyra gracilior Gredl., Jahrb. d. M. Ges. viii, p. 117, pl. 6, f. 3; Nachrbl. 1890, p. 153.—*Opeas pyrgula* A. Ad., Gredl., Malak. Bl. ix, 1887, p. 142.

An extremely slender shell, which Gredler subsequently referred to *O. pyrgula* A. Ad., I think erroneously. It is certainly related to *O. filaris* Hde.

49. O. vestitum (Heude). Pl. 20, figs. 34, 35.

Shell oblong-turriculate, covered-perforate, covered with a silky epidermis, whitish, striatulate. Spire long-conic; whorls 8, regularly increasing, joined by a slightly impressed suture, the last whorl less than a third the total length. Aperture obliquely piriform, sinuated, the columellar margin dilated, a little reflexed, umbilicus very narrow. Length, 14, diam. 3.5 mm. (*Hde.*).

China: Shanghai and ravines at Song-kiang, quite common. (*Hde.*).

Stenogyra vestita Hde., Notes sur les Mollusques terrestres de la Vallée du Fleuve Bleu, Mémoires concernant l'Histoire Naturelle de l'Empire Chinois, p. 55, pl. 17, f. 26 (1882).

50. O. hyemale (Heude). Pl. 20, figs. 36, 37.

Shell turriculate-elongate, covered with a brownish, silky cuticle, striatulate, pellucid; spire conic, the apex rather obtuse, whorls 7, flattened, joined by a scalar suture, the last whorl more than half the total length. Aperture oval, columellar margin nearly equal to the outer lip, subarcuate, a little reflexed; umbilicus very narrow. Length 8.5, diam. 2.5 mm. (*Hde*).

China: high on the mountains of Kiun-tcheu, Hupe.

Stenogyra hyemalis Heude, Mém., p. 56, pl. 17, f. 25.

51. O. FILARE (Heude). Pl. 20, figs. 38, 39.

Shell subpellucid, striatulate, slightly tawny-whitish; spire filar and scalar, whorls 7, a little flattened, and separated by an impressed suture; the last whorl half the total length. Aperture rounded at base, narrow, the columellar margin straight, short; outer margin strongly oblique, the umbilicus very narrow. Length 7, diam. 2 mm. (*Hde.*).

China: Limestone rocks of the mountains of Ning-kuo fu; two specimens (*Hde.*).

Stenogyra filaris HDE., Mém. p. 56, pl. 17, f. 27.

Related to *O. gracilior* and *O. pyrgula.*

52.. O. FUNICULARE (Heude). Pl. 20, fig. 40.

Shell turriculate-filar, glossy whitish, striatulate. Spire long, acute. Whorls 7, rather flattened, separated by a wide and quite deep suture, regularly increasing, very oblique, the last less in length than the rest of the shell. Aperture regularly oval, rather acute above; columellar margin very short, a little dilated and reflexed over the narrow umbilicus. Length 9, diam. 2.5 mm. (*Hde.*).

China: Shanghai and at Song-kiang fu, quite abundant (*Hde.*).

Stenogyra funicularis HDE., Mém. p. 56, pl. 17, f. 28.

53. O. NANKINGENSE (Heude). Pl. 20, fig. 41.

Shell turriculate-conic, white, pellucid, striatulate; spire long, rather obtuse; whorls 7, regularly increasing, joined by a scalar suture, the last as long as the others taken together. Aperture rounded-rectangular, the lateral margins subparallel, a little unequal, columellar margin rather wide, dilated over the umbilicus. Length 8.5, diam. 2.5 mm. Animal yellowish-white (*Hde.*).

China: hills below Nanking, very rare.

Stenogyra nankingensis HDE., Mém. p. 57, pl. 17, f. 24.

54. O. LUCIDULUM (Heude). Pl. 20, fig. 42.

Shell turriculate-conic, pellucid corneous, striatulate; spire

obtuse; whorls 6, regularly increasing, a little convex, joined by a deep suture, the last half the total length. Aperture squarish-rounded, the lateral margins subparallel, subequal, lower margin slightly arcuate, umbilicus narrow. Length 7.5, diam. 2.5 mm. (*Hde.*).

China: on the city wall of Ning-kuo fu, very rare.

Stenogyra lucidula Hde., Mém., p. 58, pl. 17, f. 23.

Described from one specimen.

55. O. lapillinum (Heude). Pl. 20, fig. 43.

Shell turriculate-conic, pellucid, striatulate; spire obtuse; whorls 6, a little flattened, joined by a deep suture, regularly increasing, the last half the total length. Aperture widely oval, lateral margins unequal, the columellar margin short, narrow, subarcuate, the outer margin straightened, long, basal margin widely arcuate, umbilicus narrow. Length 8, diam. 2.5 mm. (*Hde.*).

China: hills of Song-kiang, rare.

Stenogyra lapillina Hde., Mém. p. 58, pl. 17, f. 22.

"It is less swollen than the preceding, and the angle of the columellar with the upper margin is decidedly more rounded."

56. O. spoliatum (Heude). Pl. 20, fig. 44.

Shell turriculate-conic, whitish, subpellucid, striatulate; spire obtuse; whorls 6, convex, joined by a subscalar suture, the last whorl as long as the rest of the spire. Aperture quadrate-oval, the columellar margin narrow, straight, and forms nearly a right angle with the basal margin; basal margin oblique, slightly arcuate; outer margin nearly straight; umbilicus narrow. Length 7.5, diam. 2.5 mm. (*Hde.*).

China: Shanghai, not common.

Stenogyra spoliata Hde., Mém. p. 58, pl. 17, f. 21.

"It approaches *S. lucidula*; the last whorl is larger, the mouth wider, and the columellar margin narrower and long."

57. O. inflatulum (Heude). Pl. 20, fig. 45.

Shell conic-ovoid, rather solid, white, striatulate; spire

conic, obtuse; whorls 5, joined by a scalar, impressed suture, at first regularly increasing, the last whorl swollen and greater than half the total length. Aperture oval-piriform, quite narrow; outer margin nearly straight, basal margin obliquely convex, columellar margin short and dilated above over the very narrow umbilicus. Length 6, diam. 2.5 mm. (*Hde.*).

China: south of Ning-kuo fu, on ruined walls and stones.

Stenogyra inflatula Hde., Mém. p. 59, pl. 17, f. 20.

58. O. turgidulum (Heude). Pl. 20, fig. 46.

Shell ovoid-conic, pellucid-whitish, striatulate; spire short, obtuse; whorls 5, joined by a scalar suture, the first three slowly, fourth and fifth more rapidly increasing. Fifth whorl ample, two-thirds the total length, and very much swollen. Aperture quadrate-oblong, the sides unequal, outer margin longer, straightened, basal margin slightly convex, columellar margin short, dilated, forming nearly a right angle with the basal. Umbilicus narrow. Length 5.5, diam. 2.5 mm. (*Hde.*).

China: Shanghai and hills of Song-kiang fu, common.

Stenogyra turgidula Hde., Mém. p. 59, pl. 17, f. 19.

"This Stenogyre is quite common in Shanghai and its environs. It is the most egg-shaped of our species. The whorls are more oblique to the axis than those of *S. inflatula.*"

59. O. aubryanum (Heude). Pl. 20, fig. 47.

Shell small, fragile, ovate-conic; spire acute; whorls 7, joined by an impressed scalar suture; epidermis dirty, but slightly adherent. Aperture straight, oval, the columellar margin straight. Length 11, diam. 5 mm.

Stenogyra a., Heude, Mém., p. 117, pl. 30, f. 18.

China: Province Koue-tcheou.

60. O. utriculus (Heude). Pl. 20, fig. 48.

Shell small, fragile, glassy-pellucid, conic-pupoid, the spire attenuate, whorls 6, subinflated, joined by an impressed suture, the last whorl half the total length. Aperture straight,

rhombic, the columellar margin straight. Length 9, diam. 4.5 mm.

Stenogyra u., Heude, Mém. p. 117, pl. 30, f. 19.

China: Tchen-k'eou.

61. O. FARGESIANUM (Heude). Pl. 19, fig. 11.

Shell small, elongate-conic, subpellucid, spire conic, whorls 7, a little swollen, regularly increasing. Aperture straight, columellar margin short, straight. Length 10, width 2 mm. (*Hde.*).

China: Tchen-k'eou.

Stenogyra f., Hde., Mém. p. 117, pl. 30, f. 20.

62. O. FAUVELIANUM (Heude). Pl. 19, fig. 12.

Shell small, turriculate-conic; spire acute; whorls 7, flattened, joined by a subimpressed suture, regularly increasing; aperture straight, small; columellar margin very short, dilated. Length 9, diam. 2 mm. (*Hde.*).

China: Han-k'eou (A. Fauvel); Yong-tcheou fu (Fuchs).

Stenogyra f., Hde., Mém. p. 117, pl. 30, f. 21.

63. O. SETCHUANENSE (Heude). Pl. 19, fig. 17.

Shell thin, fragile, covered with a worn cuticle, long-conic; spire acute, whorls 8, regularly increasing, inflated, joined by an impressed suture. Aperture straight, narrow; columellar margin straight, dilated, subreflexed. Length 14, diam. 5 mm. (*Hde.*).

China: Koue-tcheou fu, quite abundant.

Stenogyra s., Hde., Mém. p. 118, pl. 30, f. 17.

64. O. HUNANENSE (Gredler). Pl. 19, fig. 14.

Shell turrited-cylindric, subperforate, obtusely and not regularly striate, glossy, pellucid, whitish-corneous. Whorls 9½ to 10, a little convex, joined by an impressed suture, gradually increasing, the last moderate in size. Aperture tetragonal-ovate, columella rather straight, twisted, narrowly arcuate at the base, not subtruncate, the columellar margin reflexed, free, not adnate. Length 15 to 16, diam. 3.5 mm.; penult. whorl 2, last whorl 3 mm. high. (*Gredl.*).

China: province Hunan (Fuchs).

Stenogyra (*Opeas*) *hunanensis* Gredl., Archiv f. Naturgeschichte l., 1884, p. 271, pl. 19, f. 3.

According to Gredler it differs from *S. nutans* by the smaller size, the last whorl not dilated, and the vertical columella. It is characterized among Chinese species by the cylindric form and the size, which is exceeded by *S. nutans* only.

65. O. KUANGSIENSE (Gredler). Pl. 19, fig. 15.

Very similar to S. hunanensis, but more slender, long-turrite, more strongly and regularly striate, especially at the more sloping and impressed suture, glossy, waxy-whitish. Whorls 8⅔, rather flat, very slightly terraced at the sutures, regularly increasing, the last whorl slightly widened. Aperture narrow, long-ovate, subperpendicular; columella arcuate, converging to the base, slightly truncate, outer margin of the peristome straight behind the middle, a little inflexed. Length 14, diam. 3 mm. (*Gredl.*).

China: northeastern part of the province Kuang-si.

Stenogyra (*Opeas*) *kuangsiensis* Gredl., Archiv f. Naturg. l, 1884, p. 272, pl. 19, f. 4.

Stands so near to *O. hunanus* [*hunanensis*] that it can be distinguished only by comparison. The more slender shape, the less breadth of the upper and middle whorls especially, are conspicuous. It is also less *conically* turrited, more fusiform than *hunanus*, the whorls are flatter and the suture less impressed. It is smaller than *hunanensis* and has a whorl less. (*Gredler*).

66. O. ARCTISPIRALE (Gredler). Pl. 19, fig. 16.

Shell small, subperforate, subulate, very densely hair-striatulate, with a silken luster, whitish (?). Whorls 10, a little convex, slowly increasing, twice as wide as high, the last and penultimate whorls subequal. Aperture tetragonal-ovate, short; columella a little arcuate, the columellar margin narrowly expanded, scarcely adnate. Length 9, diam. 2.33 mm. (*Gredl.*).

China: Patong, in southwestern Hupe (Fuchs).

Stenogyra (*Opeas*) *arctispira* Gredler, Archiv f. Naturg. l, 1884, p. 273, pl. 19, f. 5; not of Martens, 1867.—*Opeas arctispiralis* Gredl., Malak. Bl. (n. F.) ix, p. 142.

A small and slender, acuminate-turrited species, characterized by the close convolution of its 10 whorls and the low mouth, scarcely higher than the penult. whorl. The fine thread-like striation, which it shares with several Chinese species, dims its gloss and gives the cuticle a silky appearance (*Gredler*).

67. O. pellitum (Gredler).

Shell perforate, turriculate, densely and strongly striate, pale-corneous but clothed with a brownish hair-striate, silky epidermis, the apex smooth and rather obtuse; spire acute. Whorls 8½, the first 4 convex, small, the rest gradually increasing, high and flatter, joined by an oblique, impressed suture. Aperture narrow, long-ovate, the columellar margin dilated, a little reflexed, the outer lip rather inflexed. Length 10.5, width 2.5 mm. (*Gredl.*).

China: district of Yin-tcheu-fu, Hunan (Fuchs).

Stenogyra (*Opeas*) *pellita* Gredl., Jahrb. d. D. Malak. Ges. xi, 1884, p. 147.

Comparable in aspect with a large *Stenogyra gracilior* or a small *funicularis*. From the figure of the last, *pellita* differs in having the last whorl less inflated. The shell is clothed with a transversely striate, fibrous, brownish epidermis.

68. O. heudei n. sp. Pl. 24, fig. 30.

Shell rimate, turrite, regularly tapering, the sides straight; thin, faintly yellowish-corneous, glossy, weakly wrinkle-striate. Whorls 7½, moderately convex, the suture deeply impressed. Aperture ovate, contained about 3½ times in the length of the shell. Columella slightly concave, rather broadly reflexed above. Length 8.5, diam. 2.7, aperture 2.5 mm.

China: Hangchow, type loc., and Soochow (Hirase).

This species has a smaller apex and more slender, tapering spire than *O. clavulinum* or its Japanese form, *kyotoense*, but

has about the same size and sculpture. It is slightly more distinctly striate than *O. mauritianum* var. *prestoni*. *O. gracile* is much more strongly striate. While there would seem to be enough Chinese species described to satisfy anybody, still I can find none agreeing well with these shells. The Soochow specimens are more slender, length 8.5, diam. 2.5 mm., with 8 whorls.

VIII. *Japanese Species.*

Besides the species described below *O. gracile* occurs in the southern islands of the Japanese Empire. *O. javanicum* has been found by von Martens at Tokyo; and A. Adams has reported *O. fortunei* and *O. juncea*. The identity of the latter two is doubtful. Nevill reports a *Stenogyra* (*Opeas*) *dubia* A. Ad. from Japan (Handlist Ind. Mus., i, 164), but it is undescribed.

69. O. SATSUMENSE n. sp. Pl. 18, figs. 8, 9.

The shell is imperforate or nearly so, turrite-conic with straight lateral outlines, thin, greenish-corneous, subtranslucent. The surface has a moderate gloss, and is rather weakly and very irregularly striate, there being rather coarse, low wave-like wrinkles with narrower ripples over and among them, all strongly arcuate; the base is much smoother. Whorls 7½, much flattened, especially the later ones. Suture narrow and well impressed. The aperture is narrow and piriform, the outer lip thin, arched forward above, the basal margin retracted. Columella straight and vertical, not reaching the base, the margin below it bending to the left and retracted; columellar margin is reflexed and closely adnate in adults, a very narrow perforation existing in the young.

Length 9.8, diam. 3.3, aperture 3.8 mm.

Japan: Kaimonzan, Satsuma (Y. Hirase).

A much more conic shell than *O. gracile*, and less sharply, less regularly striate. The excised base of the columella reminds one of *O. javanicum* and its allies, which however are not otherwise closely related. *O. kyotoense* differs by its distinct perforation and the shape of the aperture.

70. O. BREVISPIRA Pilsbry. Pl. 21, fig. 7.

Shell perforate, oblong, very short for the genus, corneous, translucent, glossy, weakly, wrinkle-striate, the striæ arcuate. Spire short, regularly tapering to the obtuse apex. Whorls 5½, moderately convex. Aperture long, rhombic-ovate, the outer lip arched forward in the middle, columellar lip reflexed, not adnate except at the insertion, columella straight. Length 6, diam. 3, length of aperture 2.6 mm.

Opeas brevispira PILS., Proc. A. N. S. Phila. 1904, p. 637.

Japan: Kashima, Harima (Mr. Y. Hirase); Sakura Island, in Kagoshima Bay.

Similar to *O. kyotoensis* in the obtuse apex, open perforation, bright gloss and striation, but differing in being very much shorter and broader. The short contour is quite unusual in this genus. It needs comparison with *O. turgidulum* and *O. utriculus* Heude, of China, one of which may prove to be identical with *brevispira*. *Opeas opella* is also allied.

71. O. PYRGULA Schm. & Bttg. Pl. 21, figs. 8, 9, 10.

Shell moderately rimate, slender, subulate, thin, glossy, hyaline; spire regularly elongate-turrite, apex rather obtuse. Whorls 7½, very slowly increasing, very slightly convex, separated by a deep, subcrenulate suture, irregularly striate, the striæ deeply curved, stronger below the suture; the last whorl flattened, rounded peripherally, one-fourth the alt. of the shell. Aperture subvertical, the base a little receding, elongate-rhomboidal, or oblong and angular at both ends. Peristome simple, acute, the margin above rather straightly descending, slightly rounded forward, below a little curved. Length 8, diam. 2⅜, alt. apert. 2⅛, width 1⅜ mm. (*S. & Bttg.*)

Japan: Kobe (Maltzan, type loc.); Hirado, Hizen; Kashima, Harima; Kyoto; Sado I.; Tsukiyashi, Mino (Y. Hirase). Chichijima, Bonin Is. (Hirase), South Cape, Formosa. China: Macao, Yanghu near Fuchow, Hunan and Hainan (Schmacker).

Opeas pyrgula (A. Ad.) SCHMACKER & BOETTGER,

Nachrichtsblatt. D. Malak. Ges. 1891, p. 179, 180.—? *Opeas pyrgula* A. Adams, Ann. Mag. N. H. 1868, i, p. 459 (nude name; no locality).—Mlldff., Journ. As. Soc. Beng. liv., pt. 2, 1885, p. 61 (no description).

The shell is very narrow. The last two or three whorls are much flattened, only slightly convex, but parted by deep sutures which are more or less crenulated in places by short slender striæ below them, the rest of the surface being only rather weakly wrinkle-striate. The columella is concave, widely reflexed above. The outer lip is only very weakly arched forward. Specimens measure:

Length 9, diam. 2.1, aperture 2.3 mm., whorls 7½. Hirado.

Length 7, diam. 2, aperture 2 mm., whorls 7. Mino.

Well distinguished by its club-like shape, narrower than *Opeas gracile*, and by the deep, weakly crenulate suture, separating somewhat flattened whorls. The aperture is longer than in related forms. Fig. 8 is from Kashima, Harima; figs. 9 and 10 from Chichijima (Peel Island), in the Bonin group.

IX. *East Indian species: Sumatra, Java, Celebes and the Moluccas, etc.: New Caledonia.*

Opeas gracile occurs throughout this region, and *O. javanicum* is widely distributed in the northern islands.

72. O. densespiratum (Mousson).

Shell subumbilicate, shortly turrite, rudely and irregularly transversely striate, the striæ oblique and straight, and marked with other very minute, interrupted, decussating striæ, covered with a pale, opaque cuticle. Spire truncate-involute, rather acute; suture much impressed. Whorls 7½, convex, the last one-third the length of the spire, tapering. Aperture oblique, long-ovate; peristome unexpanded, acute; outer margin straight, rather remote above, basal regularly arcuate, columellar long, straight, widely reflexed over the narrow umbilicus. Length 18, diam. 6.5 mm. (*Mouss.*)

Java: near Buitenzorg, very rare (Zollinger).

Bulimus densespiratus Mouss., Journ. de Conchyl. 1857,

p. 159.—*Stenogyra d.*, Marts., Ostas. Zool. p. 374; Pfr., Nomenclator Hel. Viv. p. 320 (but by error "*S. densestriata* Mss." in index, p. 596).—*Acicula fusiformis* Hasselt, on unpublished plate 14, fig. 2, according to von Martens.

"Similar to *arctispira*, but with the same number of whorls it is larger, with fine spiral striæ, the last whorl one-third the total length" (*Marts.*).

73. O. arctispira (Martens). Pl. 19, fig. 25.

Shell rimate, conic-turrite, lightly striatulate, costulate at the suture, rather glossy, apex somewhat acute. Whorls 8, gradually increasing, obese, a little convex, parted by a moderately impressed suture, the last whorl slightly larger than the penultimate, rounded, somewhat flattened basally. Aperture nearly vertical, rhombic-ovate, small, less than a third the total length; columellar margin perpendicular, reflexed above, tapering towards the base, not truncate. Length 7, diam. 3, aperture 1 x 1.5 mm. (*v. Marts.*)

Java: Anjer, on Sunda Strait (Marts.); Buitenzorg (Zollinger).

Stenogyra arctispira Marts., Ostas. Zool., ii, p. 374, pl. 22, f. 10 (1867).—*Bulimus arctispirus* Marts., Pfr. Monogr. vi, p. 102.

"Distinguished from all Indian species known to me by the slow increase of the whorls, which are always much wider than high. In this feature it finds a parallel only in the somewhat larger American *Stenogyra caraccasensis.*"

74. O. kemense (Sarasin). Pl. 19, fig. 27.

Shell conic, turrite, obese, obtuse above, very narrowly umbilicate, thin and glossy. Whorls 6½, lightly convex, rather rapidly increasing, separated by a deeply cut suture, the last whorl ventricose, fully half the shell's length, and about double that of the penult whorl. Aperture vertical, narrowly piriform; peristome acute, the ends connected by a thin callus in some specimens, the columellar margin vertical and thickened, slightly twisted, reflexed. Sculpture a very fine arcuate striation. Color white with a yellowish tone. Length 8, diam. 4 mm.; length 7.75, diam. 3.75 mm.

The animal contained very large yellowish eggs.

Celebes: Kema, in the northern part.

Stenogyra (*Opeas*) *kemensis* P. et F. Sarasin, Die Land-Mollusken von Celebes, p. 145, pl. 26, f. 269 (shell), pl. 31, f. 306 (radula).

"This species is nearly related to *O. ternatana* Bttg., but much smaller and relatively decidedly more ventricose." It has much the contour of *Curvella*.

75. O. ternatanum Boettger. Pl. 19, fig. 24.

Similar to a gigantic *Opeas clavulinum*, but the shell is more conic, the apex more acute. Shell shortly rimate, conic-turrited, ventricose, thin, corneous-yellowish, slightly shining. Spire conic-turrite, the sides slightly convex, apex acute. Whorls 7, a little convex, rather rapidly increasing, separated by a linear, impressed suture; arcuately striatulate, more distinctly so at the sutures; the last whorl rather tumid, two-fifths the shell's length. Aperture perpendicular, narrowly piriform; columella vertical, straightened; slightly thickened or twisted in the middle; peristome simple, acute, the margins joined by a callous, right margin arcuately protracted, basal margin receding, columellar margin spreading and slightly thickened. Length 12.5 to 13.5, diam. 5.25 to 5.5, alt. apert. 5.5, width 3 mm. Alt. to diam. as 1 : 2.42; alt. aperture to alt. of shell as 1 : 2.36 (*Bttg.*)

Moluccas: Ternate.

Opeas ternatanum Bttg., Bericht Senck. naturforsch. Gesellsch. 1891, p. 273, pl. 3, f. 13.

Similar large and obese forms are foreign to the Moluccas. The very dull oily luster of the living shell agrees better with *Opeas* than with *Hapalus*; but by von Martens it is referred to the latter genus.

76. O. aculeus (Tapperone Canefri).

Shell very similar to *panayensis*, but much narrower and longer; whorls 10 or 10½, plano-convex, separated by a deep, channelled suture, the last whorl shorter, a half longer than the penultimate (*T. C.*)

Moluccas: Amboina (Dr. Beccari).

Stenogyra aculeus T. C., Annali Mus. Civ. Genova xx, p. 144, 1884.

77. O. SOROR (Smith). Pl. 16, fig. 84.

Shell turrite, rimate, corneous-pellucid, glossy, sculptured with oblique, flexuous growth striæ; spire subgradate, obtuse at the apex. Whorls 7, very convex, slowly increasing. Aperture straight, inversely auriform, about one-third the total length; peristome thin, the outer lip arcuately projecting, columellar lip reflexed, obliquely subtruncate below. Length 11, diam. nearly 4 mm. (*Smith*).

Lombock I.

Subulina (*Nothus*) *soror* E. A. SMITH, Proc. Malac. Soc. Lond. iii, p. 30, pl. 2, f. 15 (*April*, 1898).

"Very like *S. simplex* Guppy from Trinidad in form, but not so strongly sculptured. *Stenogyra semperi* Hid. from Mindanao is also an allied species."

78. O. BREVIUS (Smith). Pl. 16, fig. 85.

Shell covered-perforate, turrited, thin, pellucid, corneous, glossy, sculptured with growth striæ. Spire moderately lengthened, obtuse at the apex; whorls 6, conspicuously convex. Aperture inversely auriform, scarcely one-third the total length; peristome thin, the outer margin arching forward; columella lightly thickened, reflexed, slightly truncate obliquely or somewhat twisted below. Length 9, diam. 4 mm. (*Smith*).

Lombock Island (A. Everett).

Subulina (*Nothus*) *brevior* E. A. SMITH, Proc. Malac. Soc. London iii, p. 30, pl. 2, f. 16 (April, 1898).

"Shorter and proportionally broader than *S. soror,* with a more indistinct columellar truncation or oblique basal fold or twist."

79. O. PRONYENSE (Gassies). Pl. 24, fig. 33.

Shell very minute, imperforate, pale corneous, translucent, thin, diaphanous, glossy, longitudinally delicately striatulate.

Whorls 5, slightly convex, regularly increasing, the last forming half the total length; suture deep, apex rather obtuse. Aperture ovate-rounded; columella arcuate, calloused above, slightly spreading below; peristome continuous, simple, acute. Length 3.5, diam. 2 mm. (*Gass*).

New Caledonia: Prony Bay (Rossiter).

Bulimus (*Subulina*) *pronyensis* Gass. Journ. de Conchyl. 1879, p. 126; Fauna Conchyliologique terr. et fluv. de la Nouvelle-Calédonie iii, 1880, p. 43, pl. 3, f. 18 (in Actes Soc. Linn. de Bordeaux, vol. 34).

A single specimen, now in Gassies' collection was found inside the shell of *Diplomphalus megei*. Its most prominent feature is the callous thickening of the parietal wall near the posterior angle of the aperture, which if normal indicates that the species is not an *Opeas*.

80. O. BLANCHARDIANUM (Gassies). Pl. 24, fig. 33a.

Shell imperforate, elongate, thin, corneous, pale, covered with a very thin cuticle, very minutely striated longitudinally. Whorls 8, rounded, gradually increasing, the apex papillar, the last whorl angulate at the base; suture deep, crenulate. Aperture ovate, columellar margin covering the umbilical crevice. Peristome simple, slightly thickened. Length 8, diam. 3.5 mm., diam. at summit 1.5 mm. (*Gass.*).

New Caledonia: in the interior (coll. Raynal).

Bulimus blanchardianus Gass., Fauna Conch. Nouvelle-Calédonie, 1863, p. 53, pl. 6, f. 1.—*Subulina ? blanchardiana* Gass., Crosse, Journ. de Conch. 1894, p. 300.

"It is especially remarkable for the nearly right-angled lower margin." A form known only by the original description and figure which may have been based upon a broken or abnormal shell, or possibly upon a marine form.

For other New Caledonian species see under *O. gracile*.

X. *Philippine and Caroline Island Species.*

81. O. SEMPERI (Hidalgo). Pl. 19, fig. 28.

Shell slightly perforate, oblong-turrite, thin, lightly striatulate, pellucid, glossy, corneous. Spire elongated, the apex

rather obtuse; suture impressed. Whorls 7½, convex, the last one-third the total length. Columella narrow, vertical, a little reflexed above. Aperture vertical, ovate-subtruncate, basally rounded; peristome simple, unexpanded. Length 10.5, diam. 3.5 mm. (*Hid.*).

Mainit, Mindanao.

Stenogyra semperi Hid., Journ. de Conchyl. 1888, p. 36, pl. 6, f. 3.

A specimen before me seems to be a short, stout *Opeas,* not unlike some forms of Japan and China. The outer lip is strongly arched forward. The vertical columella shows, in some specimens, a barely noticeable oblique truncation below. The species seems closely related to *O. ternatanum* Bttg., a larger and more distinctly truncate species. It is more obese than *O. mauritianum.*

82. O. pilosum (Semper).

Shell conic-turrited, covered perforate, densely and very minutely striate, encircled with hair-bearing spiral lines, the hairs very minute; apex rather acute. Whorls 6, slowly increasing, slightly convex, the last tapering below. Aperture subvertical, long-ovate; columellar margin straight, rather broadly reflexed at the insertion, over the very narrow umbilicus. Length 10, diam. 4, aperture 4 x 2 mm. (*Semper*).

Luzon: Mt. Mariveles near Manila, at 2-3000 ft.

Stenogyra pilosa Semper, Reisen im Archip. Phil., Land-Moll., p. 138.

Distinguished by the hairs on the fine and close spiral lines, which are so small as to be visible under the lens only in a good light.

83. O. montanum (Semper).

Shell ovate-oblong, the apex rather obtuse, covered perforate, smooth, glossy, very pale-corneous. Whorls 6, convex, the last about two-fifths the total length, base rounded. Aperture ovate-tetragonal, the columellar margin straight, broadly reflexed, nearly closing the narrow umbilicus. Length 5.5, diam. 2.33, aperture 2 x 1 mm. (*Semp.*).

Luzon: Mt. Arayat and Antipolo Mts.

? Stenogyra montana Semp., Reisen p. 139.

84. O. arayatense (Semper).

Shell ovate-conic, imperforate, the apex obtuse, pellucid, very smooth, glossy. Whorls 7, rounded, gradually increasing, the base of the last rounded, one-third the total length. Aperture ovate-trigonal, subvertical, the columellar margin inflexed at base, strongly reflexed at the insertion. Length 8, diam. 3, aperture 2.5 x 1.5 mm. (*Semp.*).

Luzon: Mt. Arayat.

? Stenogyra arayatensis Semper, Reisen p. 139.

85. O. minutum (Semper).

Shell ovate-conic, glossy, diaphanous, waxen, covered perforate, the apex obtuse. Whorls 5½, nearly flat, the last one-third the total length. Aperture ovate-oblong; columellar margin widely reflexed at the insertion. Length 5, diam. 2, aperture 1.5 x 1 mm. (*Semp.*)

Luzon: Mt. Arayat.

? Stenogyra minuta Semper, Reisen p. 139.

86. O. hexagyrum Boettger. Pl. 19, fig. 26.

Shell small, rimate, cylindric-turrite, thin, glossy, hyaline; spire high-turrited, the apex obtuse. Whorls 6, very slowly increasing, planulate, separated by a deep, very narrowly hair-line margined suture, striatulate, the striæ deeply curved; the last whorl slightly subangular at the periphery, two-sevenths the shell's length, the base sloping. Aperture oblique, the base strongly receding, suboval, angular at both ends; peristome simple, acute, the upper margin straightened, roundly protracted above, lower margin moderately curved, forming a subacute angle with the columella, which is lightly reflexed above over the umbilical chink. Length 5, diam. 1.5, aperture 1.5 x .75 mm. (*Bttg.*).

Cebu: Monte Licos (Mlldff.).

Opeas hexagyrum Bttg., Bericht Senckenb. Ges. 1890, p. 248, pl. 8, f. 11.

"No similar small slender blunt-spired forms are known to me in this genus." (Bttg.). It resembles *O. pyrgula* very closely in shape, but is smaller and a little more deeply striate.

87. O. NITIDUM Quadras et Moellendorff.

Shell rimate, slenderly fusiform, thin, pellucid, very lightly striatulâte, very glossy, yellowish; spire gradually tapering, the apex obtuse. Whorls 6½, planulate, separated by a very deeply impressed, submarginate, subcrenulate suture. Aperture nearly vertical, roundly rhomboidal; peristome thin, acute, the outer margin strongly arched forward; columellar margin dilated above, reflexed. Length 6.5, diam. 2 mm. (*Mlldff.*).

Northern Luzon: villages of Lallo and Sanchez Mira (Quadras).

Opeas nitidum Q. & M., Nachrbl. d. Mal. Ges. Nov.-Dec. 1893, p. 177.

88. O. SUBCRENULATUM Moellendorff.

Shell rimate, slenderly subfusiform, thin, subpellucid, very closely but distinctly striatulate, silky, pale-yellowish. Spire gradually tapering, slender, the apex obtuse. Whorls 9½, a little convex, flattened in the middle, more distinctly striate at the deeply impressed suture. Aperture a little oblique, rounded-rhomboidal, the peristome unexpanded, acute; columellar margin reflexed, appressed. Light 11.5, diam. 3 mm. (*Mlldff.*).

Caramuan, Camarines province.

Opeas subcrenulatum Mlldff., Nachrbl. d. Mal. Ges. xxvii, July-Aug. 1895, p. 118.

89. O. PRUINOSUM Moellendorff.

Shell slightly rimate, a little ventricosely turrite, covered with very short and very deciduous membranous scales; silky, pale grayish-straw colored. Spire turrite, with slightly convex sides, the apex rather obtuse, whorls 9, a little convex, separated by a rather deep suture. Aperture vertical,

subrhomboidal, the peristome unexpanded, acute, the right margin arched forward, columellar margin reflexed, appressed. Length 12.75, diam. 4.75 mm. (*Mlldff.*)

Caroline Is.: Ponape (Kubary).

Opeas pruinosum Mlldff., Journ. of Malacol. vii, 1900, p. 114.

"This species belongs to the group of *O. clavulinum* P. & M. but is well characterized by the curious sculpture which gives it a somewhat hoary aspect."

90. O. kusaiense Pilsbry, n. sp. Pl. 16, figs. 89, 90, 91.

Shell perforate or rimate, turrited-conic, rather short, with nearly straight lateral outlines, olivaceous-corneous, a little translucent, often more or less varied with white spots and dots; not glossy, but having a silky luster. Sculpture of *very close, fine, deeply cut, strongly arcuate striæ.* Whorls 7 to 7½, quite convex, parted by a well-impressed suture, the last whorl rounded below. Aperture ovate-rhombic. Columella concave in the middle, somewhat protruding below, where it tapers or is obliquely subtruncate. Columellar margin reflexed as usual. Length 9.5, diam. 3.6, length aperture 3.4 mm.

Length 10.3, diam. 3.8, length aperture 4 mm.

Caroline Is.: Kusaie (L. M. McCormick).

A stouter, more compact shell than *O. javanicum*, but with similar sculpture. *O. pruinosum* Mlldff. is doubtless closely related, but is larger with differently developed sculpture. In *O. kusaiense* there seem to be delicate cuticular lamellæ on the rib-striæ, which gather and hold a coating of soil. On washing the shell, these laminæ are removed. The most obese specimen in the type lot of over fifty shells measures, length 9, diam. 3.9, aperture 3.9 mm., whorls 7.

XI. *Polynesian and Micronesian Species.*

Opeas gracile and *O. oparanum* are the prevalent species in this region. In the Hawaiian islands a number of wide-ranging forms have colonized, the following being known: *O. oparanum* (*pyrgiscus*), *O. mauritianum, O. clavulinum*

hawaiense, O. javanicum, O. opella, and *O. goodalli,* the latter being found in Manoa valley, Oahu.

Probably not one of these is truly indigenous, though *O. oparanum* may have been introduced with the Hawaiian race. The rest were probably brought within the period of commerce, together with *Zonitoides minuscula, Philomycus,* and *Agriolimax.*

In general, *O. oparanum* has a more eastern, *O. gracile* a more western distribution in the Pacific.

91. O. OPARANUM (Pfeiffer). Pl. 22, figs. 1, 2, 3, 12; pl. 24, fig. 39.

Shell subimperforate, subulate, longitudinally distinctly striate, thin, waxy-hyaline; spire subulate, rather acute; whorls 9, slightly convex, the last about two-sevenths the total length; columella slightly arcuate. Aperture oblong-oval; peristome simple, unexpanded, columellar margin very narrowly reflexed, adnate. Length 11, diam. 3, aperture 3 mm. long, 1.5 wide (*Pfr.*).

Opara (= Rapa) Island at the roots of plants south of the Paumotu group (Cuming coll.). Also Polynesia generally.

Bulimus oparanus PFR., P. Z. S. 1846, p. 34 (published in May, 1846); Monogr. ii, p. 158.—REEVE, Conch. Icon. v, pl. 87, f. 646.—*Opeas o.,* SMITH, Ann. & Mag. N. H. xx, 1897, p. 414 (Kapaur, New Guinea).—*Opeas oparica* Pfr., SYKES, Proc. Malac. Soc. v, p. 198. (New Hebrides on Efate, Vanua Lava and Valua.)

Stenogyra tuckeri Pfr., GARRETT, Journ. Acad. Nat. Sci. Phila. viii, p. 392; ix, p. 43: P. Z. S. 1887, p. 185; Bull. Soc. Mal. France 1887, p. 20; Proc. A. N. S. Phila. 1887, p. 131 (synonymy; range in Polynesia).—*Opeas tuckeri* Pfr., MLLDFF., Journ. of Malac. vii, 1900, p. 113 (Caroline Is.).

Stenogyra upolensis MOUSS., Journ. de Conch. 1865, p. 175 (Upolu, Samoa), with var. *minor* (Nukuiona, Uvea).—*Bulimus u.,* PFR., Monogr. vi, p. 100.

Stenogyra novemgyrata MOUSS., Journ. de Conchyl. 1870, p. 126 (Oneata).—*Bulimus n.,* PFR. Monogr. viii, p. 138.—

Stenogyra gyrata Mousson MS. in Mus. Godeffroy, 1885 teste Garrett (undescribed).

Opeas junceus Gld., Sykes, Proc. Malac. Soc. Lond. vi, p. 112, f. 1. (Hawaiian Is.).

Bulimus pyrgiscus Pfr. P. Z. S. 1861, p. 24; Malak. Bl. 1861, p. 15; Monogr. vi, p. 97; Novit. Conch. p. 425, pl. 96, f. 10-12.—*Opeas p.*, Sykes, Proc. Malac. Soc. vi, p. 113, f. 4.

"Differs from *O. subula* chiefly by the distinct longitudinal striæ" (*Pfr.*). The short aperture, not much exceeding one-fourth the shell's length, and the deep suture, below which the whorl is abruptly swollen, are characteristic, and in full-grown shells serve to separate the species from *O. gracile*.

In this species the whorls are not very convex but the sutures are very *deeply impressed*. The surface is finely striate and usually not very glossy. Under a compound microscope some fine spiral striæ may usually be seen. The umbilical crevice is very narrow. There is often a small prominence near the base of the columella, but in many lots this is wanting. The apical whorls are smooth. There is a good deal of variation in size.

Mr. Sykes gives no reference to connect his *O. oparica* with Pfeiffer's *B. oparanus*, yet the similarity of the names suggests that *oparica* is an emendation or error. The references given above probably pertain in part to *O. gracile*. *Stenogyra* (*Opeas*) *striolata* Pease, Sandwich Is., (W. Newcomb), recorded in Nevill, Handlist Ind. Mus., Moll., pl. 1, p. 166, 1878, *Stenogyra bacillaris* Mouss., Paetel, Catalog, p. 104, Tutuila, and *Obeliscus annaensis* Beck, from I. Annaa, Index Moll. p. 62, are nude names, applying perhaps to forms of *O. oparanum* or *gracile*.

Andrew Garrett considered all Polynesian *Opeas* to belong to one species, which he called *O. tuckeri* Pfr. I have elsewhere shown that the real *tuckeri* does not enter Polynesia. The Polynesian specimens I have seen are divisible into two species: (1) *O. gracile* with regularly rounded whorls usually puckered below the suture, and a long, rather narrow aperture, and (2) a form with the later whorls more flattened, tumid below the deep suture, the aperture de-

cidedly shorter, and the whole shell usually more lengthened. The names *B. oparanus* and *B. pyrgiscus* Pfr., *S. upolensis* and *S. novemgyratus* Mousson seem to be based upon varying forms of species (2). It is likely that further study with large series, would result in the recognition of a number of local subspecies; but this must be left to some one who can give some weeks to the question.

Pfeiffer did not illustrate his type of *oparanum*. Reeve's figure of a supposed topotype, copied in my pl. 22, fig. 12, may not be the same species. I have seen numerous specimens from the following groups: Hawaii, Marquesas, Paumotu, Society.

In the Hawaiian Is. the form has been called *O. pyrgiscus* Pfr. The original description and figure follow. *B. pyrgiscus*, pl. 22, fig. 5. Shell subperforate, turrite, rather solid, very lightly striate, whitish; spire elongate, the apex rather acute, suture deep. Whorls 9, a little convex, the last two-ninths the total length, not tapering at base; columella very slightly arcuate. Aperture slightly oblique, angular-oval; peristome simple, unexpanded, the columellar margin narrowly reflexed, subadnate. Length 13, diam. 3, aperture 2.75 x 1.5 mm. Sandwich Is. (*Pfr.*).

A large specimen from Maui is figured, pl. 22, fig. 1. It measures, length 11.3, diam. 3, aperture 3 mm., with 8½ whorls. One from Oahu, pl. 22, fig. 2, is 9.3 mm. long, diam. 2.4, aperture 2.4 mm., whorls 8½. The suture is distinctly crenulate. Others are before me from Hilo, Hawaii and Kaunakakai, Molokai (R. C. McGregor, 1900), and from Manoa valley and Round Top, Oahu, and Kona crater, Kona, Hawaii (Bernice Pauahi Bishop Museum). Young shells, one-third to a half grown, have much the appearance of *O. gracile*. The smallest one I have seen containing an egg is 7 mm. long.

Marquesas Is. A large series consists wholly of rather small and short though mature examples, pl. 22, fig. 3, length 9.5, diam. 2.8, aperture 2.8 mm., with 8 whorls. The suture is not crenulate, but the whorl bulges abruptly below it. The columella is concave and thin below.

Society Is. (*Huahine*) and *Gambier I.* or Mangareva in the Paumotu group have a form similar to the Hawaiian *pyrgiscus* in shape, but *the columella is thickened by a low tooth-like callus below* (pl. 24, fig. 39, Mangareva). Half-grown shells have the same columellar thickening. The specimen figured is 10.8 mm. long. Those from the Society Is. are somewhat smaller. A single specimen said to be from New Caledonia is similar, but I am not certain of the locality.

92. O. HEPTAGYRUM Boettger.

Differs from the allied species by the small peculiarly cylindric shell of subequal whorls, the apex obtuse, suture very deep. Shell small, perforate-rimate, subcylindric-subulate, thin, silky, waxy-hyaline; spire subulate, very slowly increasing, the apex obtuse. Whorls 7, a little convex, flatter below, separated by a very deep suture, distinctly but very delicately striate, slowly increasing; the last whorl slightly flattened in the middle, one-fourth the length of the shell. Aperture small, oblong-oval; peristome simple, acute, the right margin a little straightened, columellar margin very narrowly reflexed; columella slightly arcuate, concave. Length 6.12, diam. 2, alt. aperture 1.5, width 1 mm. (*Bttg.*).

Marshall Is.: Nauru (Paul Schnee).

Opeas heptagyrum BTTG., Zool. Jahrb., Abth. f. Syst., Geogr. u. Biol. Thiere, xx, 1904, p. 411.

"Seems to stand near *O. tuckeri* Pfr. from Sir Charles Hardy's Island, etc., but differs from the original diagnosis of Pfeiffer by the decidedly obtuse apex, 7 instead of 9 whorls, and by the index of width 1:3,06, while *O. tuckeri* has the index 1:3,27, and must thus be narrower. Both are distinguished from other related species by the cylindric shape and conspicuously short last whorl. (*Bttg.*).

This is probably identical with *O. oparanum*, or varietally distinct by its smaller size. I have seen no *Opeas* from the Marshall group.

93. O. OPELLA Pilsbry & Vanatta. Pl. 24, fig. 36.

Shell cream-colored, glossy, indistinctly irregularly striate,

rather stout, apex obtuse, whorls six, moderately convex, body-whorl high, umbilicus very small, aperture ovate more than one-third the height of the shell, outer lip evenly arched, columella sinuous and reflexed over the umbilical perforation. Alt. 6.8, diam. 2.9 mm.

Hawaiian Is.: Honolulu (W. H. Rush, type loc.); Hilo, Hawaii (McGregor).

Opeas opella P. & V., Proc. A. N. S. Phila. for 1905, p. 785, fig. 1.

This species is a little larger and more slender than *O. brevispira* Pils. and has the aperture more elongate. It is smaller and more openly umbilicate than *O. semperi* Hid. *O. hawaiense* Sykes is rougher and more slender. (*P. & V.*).

I do not feel wholly satisfied that such short forms of *Opeas* as this one, *O. brevispira* and some described Chinese forms, are really valid species. They may be shortened local or individual variations of species ordinarily longer, such as *O. mauritianum* and *O. clavulinum*. A collector on the ground must determine such questions.

I do not regard *O. opella* as a native Hawaiian species. It should be looked for in the East Indies or China.

Part II. AMERICAN ACHATINIDÆ.

Genus OPEAS (continued).

Opeas is represented in America by four species extending over nearly the whole tropical region, and by a number of local forms. Most of the American species do not differ much from the Oriental forms, but one, *O. beckianum*, has short rounded whorls and a distinct umbilicus at all stages of growth. A form of this species has been made the type of a new genus, *Synopeas*, by M. Jousseaume. This might be retained as a subgenus, yet it is connected with ordinary *Opeas* by the intermediate species *O. micra*. The species are arranged as follows:

Generally distributed forms, species 1 to 4.
Antillean forms, species 5 to 8.
South American forms, species 9 to 15.
Central American and Mexican forms, species 16 to 23.

Species Common to South and Middle America and the Antilles.

The four common American *Opeas* are very distinct and easily recognized, though their wide range and variability has resulted in an extensive synonymy.

O beckianum. Umbilicate, stout, with closely coiled whorls. Length 6.2 to 9 mm., with 8 to 9½ whorls. Surface more or less ribbed.

O. micra. Perforate, with very obtuse summit, more or less ribbed on the spire, with 7 or 8 whorls in a length of 6 to 9 mm., diam. 2 to 2.7 mm.

O. gracile. Perforate, slenderly tapering, closely arcuately, striate, with 7½ to 8½ whorls in a length of 9-11.5 mm.

O. goodalli. Slender, minutely perforate, with straightly conic spire, *very arcuate* striæ and outer lip, and about 6½ whorls in a length of 6 to 7 mm.

1. O. BECKIANUM (Pfeiffer). Pl. 27, figs. 42-46, 54, 55.

Shell perforate, ovate-oblong, acuminate, thin, diaphanous, greenish-hyaline, densely costulate-striate, the riblets stronger at the crenulated suture. Whorls 9, convex, the last about one-fourth the total length, base rounded, columella short, rather straightened. Aperture wide, semioval; peristome simple, acute, the columellar margin spreading. Length 9, diam. 3.5, aperture 2.33 x 1.5 mm. (*Pfr.*).

Eastern Mexico from the State of Vera Cruz southward; Central America; Colombia, Venezuela, Trinidad; Barbados, St. Vincent, Antigua; Haiti. Brazil, at Para, Rio de Janeiro, Sao Paulo, and Fernando Noronha, and Peru.

Bulimus beckianus PFR., Symbolæ ad Hist. Heliceorum iii, p. 82 (1846); Monogr. ii, 164; Conchyl. Cab. p. 125, pl. 36, f. 29-31.—*Opeas beckiana* Pfr., SMITH, Proc. Malac. Soc. i, p. 309; Journ. of Conch. viii, p. 236; Journ. Linn. Soc. Lond. xx, Zool., p. 502, 1890 (I. Fernando Noronha).—? *Bulimus oryza* BRUG., Encycl. Méth. i, p. 333.—DESH. in Lam., An. s. Vert. viii, p. 263.—REEVE, Conch. Icon. v, pl. 68, f. 480. *Bulimus caraccasensis* REEVE, Conch. Icon. v, pl. 79, f. 580 (Sept. 1849).—PFR., Monogr. iii, 404; viii, 140.—*Opeas caracasensis* CROSSE & FISCHER, Moll. Mex. i, p. 599, pl. 26, f. 6. —STREBEL Beitrag v, p. 99, pl. 7, f. 8; pl. 17, f. 30; pl. 18, f. 4, 10, 11 (anatomy).—CROSSE, Journ. de Conchyl. 1890, p. 45 (Trinidad, St. Lucia, Grenada, Guadeloupe, etc.).—*Opeas micra* and var. *caracasense* MARTENS, Biologia Centrali Amer., Moll. p. 294, pl. 17, f. 10, 11.—*Synopeas caracasensis* JOUSS., Mem. Soc. Zool. France ii, p. 239, 1889.—*Stenogyra caraccasensis Reeve,* MAZE, Journ. de Conch. xxxi, 1883, p. 6, 41 (Guadeloupe).

Bulimus regularis PFR., Zeitschr. f. Malak. 1852, p. 94; Monogr. iii, p. 402; Conchyl. Cab. p. 152, pl. 39, f. 20-22.—HIDALGO, Viaje al Pacifico p. 123.—*Opeas regularis* Pfr., STREBEL, Beitrag Mex., etc., v, p. 102, notes on type.

Stenogyra gabbiana ANGAS, P. Z. S. 1879, p. 485, pl. 40, fig. 17.—*Bulimus vitreus* Muhlf. in ANTON, Verzeichniss, p. 42, nude name, according to Pfr.

The locality was supposed by Pfeiffer to be the island Opara, but no form similar to this has been found in Polynesia. Pfeiffer's description and figures agree fully with Central American examples, such as that shown in pl. 27, figs. 44-46, from Polvon, Nicaragua. The shell is narrowly umbilicate, the columella being hollow and large throughout (fig. 44). The shape is characteristic, the upper third of the length tapering conically while the rest of the shell is subcylindric. It is very pale yellowish-corneous, somewhat translucent, very glossy. The riblets are strong and regular below the suture, which is crenulated by them, but become weaker or even subobsolete downwards below the middle of each whorl; and they often give place to striæ on the last whorl. Whorls 8½ to 9, strongly convex, the last rounded below. The aperture is vertical. Columellar margin well dilated. Length of figured specimen 9.1, diam. 3.5 mm. Polvon, Nicaragua.

Further north, in the State of Vera Cruz, the shells are usually more slender and taper more regularly. The ribs are strongly developed on the intermediate whorls, subobsolete on the last one or two. Specimens from Mirador (pl. 27, fig. 55) measure:

Length 9.8, diam. 3 mm., whorls 9½.

Length 8.3, diam. 2.7 mm., whorls 9.

Other lots before me from Orizaba, Antigua and Vera Cruz are similarly sculptured though some of the shells are wider. Strebel has treated in detail of the distribution and dimensions of East Mexican specimens, and Von Martens also has entered fully into its distribution.

A large series from Carthagena, Colombia, are very small, length 7, diam. 2.4 mm., whorls 8½, in other respects being typical, or with the riblets below the suture very short, the rest of the surface merely striate, and the umbilicus smaller. Similar lots are before me from Venezuela, Trinidad and "Brazil."

A series from Para, Brazil, consists of rather weakly sculptured shells, reaching the length of 7 mm., with 8½ whorls.

Barbados shells are 7 to 9 mm. long, with typical or weaker sculpture and a small umbilicus.

A set before me from Antigua consists of rather narrow shells with delicate riblets, and a more tapering shape than the types.

In Haiti (pl. 27, fig. 54) this species is found at S. Domingo City (H. Prime) and around Port au Prince (Henderson and Simpson). The shells are small, length 6.2 mm. with 8 whorls to 8 mm. with 9½ whorls. The riblets below the suture are very short, the rest of the surface being striate. This small form imitates the Colombian examples described above.

A variety with very strong, regular ribs (pl. 27, figs. 42, 43) is before me from Caracas, Venezuela, collected by F. R. Cocking in 1860. The shells measure about 8 x 3 mm., with 8½ whorls, some being smaller.

Mr. Smith states that specimens from Fernando Noronha are more strongly costulate than the Brazilian specimens compared (Journ. Linn. Soc. Lond. xx, p. 502).

Bulimus oryza of Bruguiere, from Guadeloupe was probably based upon this species, but the description is not wholly conclusive; the number of whorls especially does not agree.

Two forms described by Jousseaume from Caracas seem to be referable to *O. beckianum*, either as synomyms or varieties. The descriptions follow.

"*Synopeas simoni.* Pl. 27, fig. 40. Shell perforate, cylindric-turrite, rather thin, slightly striatulate, waxy, marked with small scattered whitish spots; spire elongate, turrite, rather acute; whorls 8½, convex, separated by a deep suture, the last scarcely one-fourth the total length, rounded at the base. Aperture oboval; peristome simple, unexpanded, the columellar margin shortly spreading. Length 7, diam. 2.5 mm." (*Jouss.*).

According to M. Jousseaume, this differs from *O. caracasensis* by the smaller size, less apparent striæ, by the white spots and narrower umbilicus. Four specimens taken, one adult at the colony of Tovar, the others young, at Caracas. This is evidently identical with the form from Carthagena, etc., which I have commented on above.

The smoothness is an individual character, though colonies where the average or majority of the shells are of the smoothish type might be recognized by a varietal name.

"*Synopeas carinulata.* Pl. 27, fig. 41. Shell perforate, cylindric-turrited, rather thin, ribbed with hair-like striæ, reddish-yellow; spire elongate, conic and turrited, the apex obtuse. Whorls 7½, subconvex, separated by a deep suture, the last one-fourth the total length, carinate in the middle. Aperture subtrigonal-oval, the peristome simple, unexpanded, the columellar margin straight, slightly reflexed. Length 6, diam. 2.25 mm." (*Jouss.*).

Caracas, Venezuela (Simon).

Synopeas carinulata Jouss., Mem. Soc. Zool. de France ii, p. 240, pl. 9, f. 6, 1889.

Described from two specimens which I think are probably young shells. It is said to be distinguished from *caracasense* and *simoni* by the smaller size, stronger, more spaced striæ, the more projecting carina of the last whorl, less convex whorls, and the triangular shape of the mouth. *Cf. O. micra.*

Var. *gabbianum* (Angas). Pl. 27, figs. 52, 53.

"Shell perforate, elongately turreted, moderately thin, pale straw-colored, sculptured with somewhat distant raised thread-like descending striæ, that are strongest on the upper whorls and become evanescent towards the sutures and the base of the last whorl; whorls 8, convex; apex blunt, papillar; aperture vertical, quadrately semilunar; outer lip, arcuate, thin, simple; columellar margin a little expanded over the perforation. Diam. 1¼, alt. 3¼ lin." (*G. F. Angas*).

Costa Rica; a single specimen (*Gabb*).

"A somewhat sparsely and strongly ribbed species, distinct from *S. caraccasensis* Reeve, which is described by that author as a *Bulimus.*" (*Angas*).

Var. *regulare* (Pfr.).

Surface striatulate, being much more weakly sculptured than *beckianum*, but denticulate at the suture.

Brazil: Rio de Janeiro (Macgillivray, Hidalgo).

Length 6, diam. 2½ mm., whorls 7 (*Pfr.*, young shell).

Length 8, diam. 3 mm., whorls 7 to 8 (Hidalgo).

Strebel's examination of the type leaves no doubt of the rank of this form as a local variety of *O. beckianum.*

2. O. MICRA (Orbigny). Pl. 27, figs. 49, 56-57.

Shell elongate, turriculate, thin, translucent, very strongly striated with small sharp and raised ribs: nearly umbilicate; spire long, nearly conic, with the end obtuse, composed of 8 not much rounded whorls; aperture oval, with sharp margins; columella straight. Color yellowish-white. Length 6, diam. 2.5 mm. This species is especially related to *B. clavulus* but differs chiefly by its raised ribs. (*Orb.*).

Bolivia: easternmost foothills of the Bolivian Andes, not far from Santa Cruz de la Sierra, under stones (Orbigny, type loc.). Brazil: Rio de Janeiro (Orb.); Fernando Noronha I.; Pará (Hubbard). Colombia at Honda (T. Bland). Trinidad (Guppy).

Central America and Mexico: Polvon, Nicaragua (McNiel); Utilla I., Honduras (Simpson); Progreso, Izamal, Ticul, Tunkas and Tekanto, Yucatan (Heilprin exped.); San Juan Bautista, Tabasco (Rovirosa); Vera Cruz Heilprin exped.); San Rafael Jicaltepec (Townsend); Antigua and Texolo, V. C. (Rhoads).

West Indies: Grenada, Grenadines, Barbados, St. Vincent, Guadeloupe, Antigua, St. Eustatius, St. Bartholomew, St. John, St. Thomas, St. Croix, Porto Rico, Haiti, Cuba and Jamaica. Also reported by Tate from St. Lucia.

Florida: Miami.

Introduced in Bermuda (Heilprin!), Charleston, S. C. (Binney), Mauritius (Nevill!).

Helix micra ORB., Mag. de Zool. 1835, p. 9.—*Bulimus micra* ORB., Voy. Amér. Mérid. Moll., p. 262, pl. 41, f. 18, 19, 20.—PFR., Monogr. ii, 165 iii, 400; iv, 462; vi, 100.—REEVE Conch. Icon. v, pl. 14, f. 78; pl. 79, f. 579 (Chilon, Bolivia).—*Opeas micra* Orb., SMITH, Proc. Malac. Soc. Lond. i, p. 309, 318, 322 (St. Vincent, Grenada, Grenadines); Journ. of Conch. viii, p. 237 (Trinidad).

Bulimus octonoides C. B. ADAMS, Proc. Boston Soc. Nat. Hist. 1845, p. 12 (Jamaica).—REEVE, Conch. Icon. v, pl. 84, f. 593.—PFR., Monogr. ii, 160; iii, 400; iv, 460; vi. 99.—*Stenogyra octonoides* MAZE, Journ. de Conch. 1883, pp. 6, 41 (Guadeloupe).—BINNEY, Terrestrial Moll. v, p. 194, Man. Amer.

Land Shells, p. 425 (Ft. Dallas, Fla.; Charleston, S. C.).—Angas, P. Z. S. 1879, p. 485 (Costa Rica).—Smith, Journ. Linn. Soc. London xx, Zool., p. 502 (Fernando Noronha).—*Opeas octonoides* Crosse, Journ. de Conch., 1890, p. 246 (Cuba, etc.); 1892, p. 28, 62 (Porto Rico, Vieques).—Martens, Biologia Centr. Amer. Moll., p. 293, pl. 17, f. 9 (Mexico, etc.).—*Bulimus subula* Pfr., Binney, Terr. Moll. U. S. ii, p. 285, pl. 53, f. 4.—*Bulimus contractus* Poey, Memorias i, p. 205, 212, pl. 26, f. 19-21 (San Diego de los Banos, Cuba).—*Stenogyra* (*Opeas*) *striosa* Ad., Henderson, Nautilus viii, p. 20, no. 114 (Jamaica).—*Opeas dresseli* Miller, Malak. Blätter (n. F.) i, 1879, p. 123, pl. 14, f. 1 (Guayaquil, Ecuador).

O. micra is the most widely distributed American *Opeas*. It was described from Bolivia, near or at the southern extreme of its range. The type figures, copied on pl. 27, fig. 49, are good except in showing the apex too acute, an error commonly made in figuring *Opeas*. The shell is perforate, and tapers regularly to the very obtuse apex. The first 2 or 2½ whorls are smooth; then *widely spaced thread-like striæ* appear in high relief on the weakly striatulate surface, and are usually strongest near the suture above. On the last whorl the striæ became less emphatic and closer. This description applies to well-sculptured shells, such as pl. 28, fig. 58 from Honda, Colombia, measuring 6.8 x 2.1 mm., with 7 whorls. Very often the striæ are much weaker, almost obsolete except immediately below the sutures; and there are, in most lots, intermediate forms also. Part of the Colombian and Para shells before me are of this sort.

The Central American shells are similar to Colombian; but in Yucatan a longer, more slender form prevails, quite like the large Cuban type. One from Izamal measures 8.8 x 2.5 mm., with 8 whorls. Most shells in a very large series from San Juan Bautista, Tabasco, are deficient in riblets (pl. 28, fig. 59). The specimens from the State of Vera Cruz are also rather weakly sculptured.

In Cuba some diversity is encountered. Some shells, as at Marianao near Havana, are typical. Others (pl. 27, fig. 57),

are much elongated 9.6 x 2.7 mm., with about 8½ whorls, and rather irregular sculpture. This is *B. contracta* of Poey. If it be thought varietally separable from *micra*, part of the Yucatan shells would be referred to the same race.

In Haiti, *O. micra* was taken by Messrs. Henderson and Simpson at Cape Hatien, Charmette three miles southward, and at Sans Souci, and by H. Prime at Santo Domingo City. It is a rather diminutive race, usually not well sculptured, the largest measuring 7 x 2.1 mm., with 7 whorls, but most individuals are smaller.

Jamaican specimens vary like those of Cuba in form and sculpture, but do not reach quite so large a size. A common form is illustrated, pl. 27, fig. 56, (Kingston), but others in the same lot are larger and less ribbed. The J. B. Henderson collection contains specimens from near Port Antonio, Blackstone River, Bluefield, Bogwalk, Bowden, Hope River, Mona House, Montego Bay, Ocho Rios, Mt. Pleasant, and Rockport, near Kingston.

Bulimus octonoides C. B. Ad., of which I have examined Adams' type series, is absolutely equivalent to *O. micra*.

In the lesser Antilles, only very small specimens are before me from St. Thomas and St. Eustatius. In the other islands the shells are not distinguishable from the ordinary Jamaican form.

In the United States, *O. micra* is known to me from Miami in southeastern Florida, where I have found it abundant. Half-grown and adult specimens are figured (pl. 28, figs. 60, 61).

Achatina lucida Poey was based upon a single young specimen of *micra*. The original description follows: shell ovate-oblong, vitreous, whitish, elegantly sculptured with regular transverse riblets; apex obtuse; whorls 6, convex, the suture profound. Aperture small, margin acute; columella straight, narrowly folded back, covering the umbilicus completely. Length 3 mm. Near the Canimar river, on the east side of Matanzas Bay, coll. Dr. Gundlach. Poey's figure is copied on my pl. 28, fig. 64.

Pfeiffer subsequently identified specimens from Havana as

the adult of *lucida*, giving a new description and figures. Specimens received from Poey as *lucida* are undoubtedly *micra*.

Achatina lucida Poey, Memorias sobra la Historia Natural de la isla de Cuba, i, pp. 207, 212, pl. 12, f. 30, 31.—*Stenogyra l.*, Poey, t. c. p. 396.—Gundlach, Malak. Bl. iv, 1857, p. 44. —*Bulimus lucidus* Poey, Pfr., Novit. Conch. p. 430, pl. 96, f. 36-38 (Havana); Monogr. iv, 459; vi, 98.

Var. *margaritaceum* (Shuttleworth). Pl. 28, fig. 62.

Shell narrowly perforate, turrite, sharply and remotely striate, with a pearly luster, diaphanous, waxen. Spire obtuse; whorls 6, a trifle convex (*vix convexiusculi*), the last about two-sevenths the total length; suture deep; columella rather straight. Aperture ovate-oblong, the right margin of the peristome somewhat flexuous, columellar margin reflexed. Length 5, diam. scarcely 2, aperture about 1.25 x .75 mm. (*Shuttl.*).

Porto Rico: Rio Blanco in the Sierra de Luquillo. (Blauner).

Stenogyra (*Opeas*) *margaritacea* Shuttl., Diagnosen neuer Mollusken no. 6, p. 139, extracted from Mittheil. naturforsch. Ges. in Bern, 1854, p. 47.—*Bulimus margaritaceus* Sh., Pfr., Monogr. iv, p. 460.

I figure a specimen from Rio Blanco, determined by Thomas Bland. It agrees perfectly with Shuttleworth's diagnosis in size, but has a larger aperture, nearly 2 mm. long, and the whorls are moderately convex.

Var. *tryonianum* (Tate). Pl. 28, fig. 63.

"Shell conically subulate, semipellucid, not umbilicated, whorls seven in number, rather flattened, shouldered at the suture, ornamented with numerous nearly straight longitudinal costæ, interstitial spaces smooth; suture somewhat impressed; columella a little thickened; aperture elliptical, outer lip straight and simple. Total length of shell .22 inch; breadth 0.075 inch; height of last whorl 0.075 inch." (*Tate*).

"In the forest on an island in the lagoon of Boco del Toro, on the borders of Panama and Costa Rica." (Tate).

Bulimus tryonianus Tate, Amer. Journ. of Conch. v, p. 157,

pl. 16, f. 4 (Feb. 3, 1870).—*Opeas t.*, MARTENS, Biol. Centr. Amer. Moll., p. 296, with var. *subovale*, pl. 17, f. 12.

The type or a cotype of this species received from Tate is bleached and minutely perforate. It tapers regularly to the very obtuse apex. The surface is sculptured with very regular and delicate riblets, straight on the spire, but somewhat arcuate on the last whorl. These riblets are a trifle closer and weaker than in the Yucatan *O. micra*. In other respects I am quite unable to see any difference from *micra* of the same size. The shell measures, length 4.9, diam. 2, aperture 2 mm.; whorls 5¾. This is the specimen badly figured in Amer. Journ. Conch., and corresponds in size with Tate's measurement, but it has not the number of whorls called for in his description, which I think may have been partly taken from *O. goodalli*, of which there were specimens in the same vial. Tate's identifications of Stenogyrinæ were chiefly erroneous; and this applies also to a good many other snails, listed in his paper, as I know from the set sent to Mr. Tryon.

Var. *subovale* Martens (Pl. 28, fig. 65), "a little more ovate, umbilicus narrow but not closed. Shell ovate-subturrited, vertically lightly striatulate, whorls 6, a little convex, the last, measured at the back, contained 2⅔ times in the alt.; narrowly perforate, the aperture rhombic-elliptical, columellar margin slightly thickened. Length 5.5, diam. 2 aperture 2 x 1.33 mm. S.-W. Costa Rica at Turubanes, 500 meters elevation."

Var. *cuencanum* (Pfeiffer).

Shell subperforate, oblong-turrite; rather solid, chordate-costulate, pellucid, greenish-white. Spire regularly turrite, the apex rather obtuse. Whorls 6, a little convex, the last about one-third the total length, slightly compressed basally. Columella vertical. Aperture vertical, truncate-oval, peristome simple, unexpanded, the columellar margin shortly reflexed, somewhat free. Length 8, diam. 3.25 mm.; aperture 2.66 x 1.5 mm. (*Pfr.*).

Ecuador: Province of Cuenca (Fraser; Cuming coll.).

Bulimus cuencanus PFR., Malak. Blätter v, 1858, p. 239;

P. Z. S. 1859, p. 26; Monogr. vi, p. 98.—*Rumina cuencana* H. Ad., P. Z. S. 1870, p. 375.

This unfigured form may prove identical with, or a variety of, *O. micra,* which is known from Ecuador. The description, given above gives no adequate ground for considering it a distinct species.

3. O. GRACILE (Hutton). Pl. 28, fig. 70.

Cf. p. 125. This species occurs in tropical America in forms indistinguishable from those of the Oriental region, though Occidental specimens have usually been known as *O. subula* Pfr. Its chief characters are the straight, high spire, very equable and moderate convexity of the whorls, the distinct, *arcuate* striation, usually appearing a little puckered below the suture, and the long aperture. As in the Orient, a slender and a stouter form may be recognized, usually occurring together. Local variation is chiefly in size and number of whorls, different colonies in one general locality often showing the extremes of variation, as in the following from around Havana:

Length 9, diam. 2.9, length aperture 2.9 mm., whorls 7½ (El Vedado).

Length 11.5, diam. 3, length aperture 3.2 mm., whorls 8½ (Marianao).

It often reaches a large size, quite equal to typical *gracile,* some from Merida, Yucatan being 13.5 mm. long, with 9½ whorls.

Distribution, entire West Indies; South America as far as Pará and Guayaquil; Southern Mexico and Central America. I have examined specimens from the following places. Cuba: Havana and environs, Formosa, Castillo de Jagua at entrance of Cienfuegos Bay, Santiago. Haiti: Sans Souci, St. Mark, Port au Prince (Henderson and Simpson); Jeremie "*S. octonula*" Weinland); Santo Domingo City (H. Prime). Jamaica: Kingston (W. J. Fox). Porto Rico: San Juan. St. Thomas, St. Croix, St. Bartholomew, St. Johns, St. Eustatius, Antigua, Guadeloupe, Barbados, Trinidad. Brazil: Para. Venezuela: Maracaibo (E. S. Penny, 1853). Colombia. Also

reported from Guayaquil, Ecuador (as *O. acutius* Mill.). Panama (Gabb), Chontales, Nicaragua (R. Tate); Utila, I., Honduras (Simpson). Also reported by von Martens from British Honduras at Belize; Guatemala at Coban and Antigua; Nicaragua at Acoyapa; Costa Rica at Puerto Viejo. Mexico: Merida, Yucatan (Heilprin); San Juan Bautista, Tabasco (Rovirosa); and reported by von Martens from the additional States of Vera Cruz, Jalisco and Chiapas.

A few other localities are recorded in the literature, see below. It has been found in a hothouse at Exeter, England (Coll. A. N. S. P.).

Achatina subula Pfr., in Wiegmann's Archiv f. Naturgeschichte, 1839, i, p. 352.—*Bulimus subula* Pfr., Symbolæ ad Hist. Hel. i, p. 85; Monogr. ii, 158; iii, 399; iv, 458; vi, 97; viii, 136 ("Cuba, common around Havana and Matanzas"); Malak. Bl. 1854, p. 196.—Reeve, Conch. Icon. v, pl. 69, f. 494. —*Stenogyra subula* Pfr., Shuttleworth, Diagnosen, etc., no 6, p. 138, in Mittheil. naturforsch. Ges. in Bern, 1854, p. 46. —Poey, Memorias, i, p. 396.—Martens, Malak. Bl. xii, 1865, p. 49 (Mex.).—Binney, Terrestr. Moll. U. S. v, 195, fig. 97 (jaw), 99; pl. 4, f. P (dentition); Man. Amer. Land Shells p. 426, f. 473 (Mobile, Alabama).—Maze, Journ. de Conchyl. 1883, p. 6, 41, 47, 51 (Guadeloupe); Journ. de Conch., 1890, p. 22 (Guadeloupe and dependencies).—Smith, Journ. Linn. Soc. Lond. xx, p. 502 (Fernando Noronha).

Opeas subula Fischer et Crosse, Miss. Scient. au Mexico, Moll., i, p. 600, pl. 26, f. 7.—Ancey, Ann. de Malac. 1886, p. 250 (Utila I., *Simpson*).—Martens, Biologia Centr. Amer., Moll., p. 291, 637, pl. 18, f. 3 (living animal).—Smith, Proc. Malac. Soc. Lond. i, p. 317 (Grenada).—Crosse, Journ. de Conch. 1890, p. 246 (Cuba); 1891, p. 150 (Santo Domingo); 1892, p. 28 (Pto. Rico).—*Stenogyra octonula* Weinland, Malak, Blätter xxiii, 1876, p. 171, pl. 2, f. 7, 8 (Jeremie, Haiti).—*Bulimus octonulus* Pfr., Monogr. viii, p. 613.—*Opeas o.*, Crosse, J. de C., 1891, p. 150.—*Bulimus octonoides* d'Orbigny, in Sagra's Hist. Cuba, Moll., i, p. 177, pl. xi bis, f. 22-24.—*Opeas acutius* Miller, Malak. Bl. (n. F.) i, 1879, p. 124, pl. 13, f. 3 (Guayaquil, Ecuador); *cf.* Strebel, Beitrag

v, p. 106 (*Opeas acutior*).—*Opeas junceum Gld.*, MARTENS, Sitzungsber. Ges. Naturforsch. Freunde zu Berlin, 1898, p. 156 (Cocos I.).—*Bulimus hortensis* C. B. ADAMS, Contrib. to Conch. no. 9, p. 168, 1851 (gardens in Kingston, Jamaica).

The several names comprised in the above references are absolute synonyms. *S. octonula* of which I have two specimens from the author, is a typical *gracile* of the slender phase. One is figured, pl. 28, fig. 71. *B. hortensis* Ad. of which I have seen Adams' specimens, was based on the stouter form of the species, in which the whorls are less oblique. It is common at Kingston, but so far as I know, not spread over the island. *O. acutius* Miller has been from a study of the types pronounced *subula* by Strebel, a conclusion fully supported by the description and figures.

I have figured also a rather small specimen, fig. 70, length 9 mm., from Havana, the type locality of *subula* Pfr.

4. O. GOODALLI (Miller). Pl. 28, figs. 72, 73, 74.

"A subperforated, turretted, pellucid, pale corneous, or almost white shell, having from six to seven volutions, and an ovate aperture.

"*Observations.*—The inhabitant a limax of a green-yellowish color, which is transmitted through the shell, and gives it that tinge when found with the animal in it. On account of the pine bed being frequently disturbed, full grown specimens are rare, and I possess but few that show seven volutions, the major part having from four to five. When full grown, one-third of an inch, or rather more, long." (*J. S. Miller.*)

Imported into England: Bristol, on the boards that line a pine (Bromelia) bed, Miller, type loc., and other hothouses near London, Manchester, etc.; also Cape Verde Is.; St. Helena; Rodriguez; Hawaiian Is. at Manoa Valley, Oahu (Bishop Mus.).

West Indies: Cuba, around Havana, Matanzas, Sancti Spiritus, Trinidad and Santiago. Haiti, at Cape Hatien and Port au Prince (Henderson and Simpson). Jamaica: west of Port Antonio (Henderson and Simpson). Porto Rico, San Juan and other places. St. Thomas; St. Eustatius; St.

Lucia; Barbados.—South America: Para (Dr. Hubbard); Venezula (R. Tate); Colombia (Swift coll.). Also reported from Boliva, Argentina and Ecuador.—Central America: Polvon, Nicaragua (McNiel Exped.); Boca del Toro, on Panama and Costa Rica boundary (R. Tate). San Juan Bautista, Tabasco, Mexico (José N. Rovirosa, 1892).

Helix goodalli J. S. Miller, a list of the freshwater and landshells occurring in the environs of Bristol, with observations, Annals of Philosophy n. ser. iii, 1822, p. 381.—*Bulimus goodalli* Gray in Turton's Manual of the L. and F.-W. shells of the British Islands, new edition, 1840, p. 6, pl. 6, f. 61.—Pfr., Monogr. ii, 159; iii, 400; iv, 461; vi, 100; viii, 138.—Reeve, Conch. Icon. pl. 84, f. 621.—Forbes & Hanley, Hist. Brit. Moll. iv, 1853, p. 93.—Morelet, Journ. de Conchyl. 1875, p. 24 (Rodriguez).—*Stenogyra goodallii* Wollaston, Testac. Atlantica p. 510 (Cape Verde Is. S. Antao, S. Nicolao, S. Iago and Brava).—Shuttleworth, Diagnosen no. 6, p. 139 (Porto Rico.—Maze, Journ. de Conch. 1883, p. 7, 42, 47 (Guadeloupe).—*Opeas goodallii* Mill., Smith, Proc. Malac. Soc. Lond. i, p. 308 (St. Vincent).—Crosse, Journ. de Conch. 1890, p. 245 (Cuba); 1892, p. 29 (Pto. Rico).

Helix (*Cochlicella*) *clavulus* Fer., Prodr. p. 52, no. 381 (Guadeloupe; no description).—Moricand, Mém. Soc. Phys. et d'Hist. Nat. de Genève vii, 1836, p. 424 (Bahia; no description).—*Bulimus clavulus* Turton, Manual of the land and fresh-water Shells of the British Islands, p. 79, fig. 61 (1831).—Orbigny, Voy. dans l'Amér. Mérid. p. 261 (Bolivia and Argentina).—? Potiez et Michaud, Galeriè, etc., i, p. 151, pl. 14, f. 27, 28 (Guadeloupe). Not *H. clavulus* Quoy = *O. gracile*.—*Bulimus compressilabris* Benson, Ann. Mag. N. H. (2), xviii, Nov. 1856, p. 434 (public garden, Jamestown, St. Helena) = *O. goodalli* Mill., teste E. A. Smith, Proc. Zool. Soc. Lond. 1892, p. 259.—*Opeas aciculæforme* Miller, Malak. Bl. (n. F.) i, 1879, p. 125, pl. 13, f. 4.—Strebel, Beitrag Mex. etc., v, p. 106, pl. 17, f. 13.—*Stenogyra ascendens* Poey, Memorias i, p. 422 (1854).—Gundlach, Malak. Bl. iv, 1857, p. 44 (description of living animal).—*Opeas ascendens* Crosse, J. de Conch. 1890, p. 246.

—*Bulimus assurgens* Pfr., Malak. Bl. ii, 1856, p. 156; Monogr. iv, 459; Novit. Conch. p. 431, pl. 96, f. 39-41. *Cf.* Smith, P. Z. S. 1892, p. 269.

Bulimus pumilus Pfr., Archiv f. Naturg. 1840, p. 252; Mal. Bl. v, p. 184.

B. pauperculus C. B. Ad. in part, Contrib. to Conch., p. 27.

O. goodalli is very minutely perforate, straightly conic, with a very obtuse apex. The surface is not very glossy and is densely, sharply sculptured with irregular and rather strong striæ very deeply curved, or arcuate. The outer lip is thin, and *so much retracted above as to appear incised at the suture,* as in some Pleurotomidæ. The aperture is well rounded below, and the columellar lip is reflexed as usual in *Opeas.*

The general shape, the sculpture, and the retraction of the outer lip at the suture, make this species easy to recognize.

Length 6, diam. 2, aperture 2 mm., whorls 6½. Para.

Length 6.3, diam. 2, aperture 2 mm., whorls 6½. Havana.

This wide-spread little species was originally described from a colony found around "pines" in Bristol, England. Since "*Bromelia*" *bracteata*, imported from Jamaica in 1785, was the only species of pineapple at that time cultivated in England, it is likely that the original stock of *goodalli* came in dirt around the roots, and from Jamaica; though the ultimate habitat of the pineapple was probably Brazil, a country equally inhabited by the *Opeas.* The snail is said to have been first observed about 1816. It is now found in many hothouses in England, around London, Manchester, etc. It has also been imported into various tropical countries, and will doubtless attain as wide a range as *Subulina octona* and *Opeas gracile* in time.

Mr. Miller's description is not very good, but subsequent publications referring to his specimens indicate conclusively their identity. It was named by Férussac at about the same time, but he did not define his *H. clavulus*, which remained a nude name until 1831, when Turton excellently figured it from Bristol examples. The two names *goodalli* and *clavulus* are therefore absolutely synonymous. Whether the *clavulus* of Moricand and Orbigny is the same is not certainly known;

but Quoy & Gaimard's *clavulus* is surely *O. gracile* (*q. v.*).

I have already alluded to the distribution of *O. goodalli* in the Old World, see pp. 141, 151, 157. *O. hannensis* Rang and *O. braueri* Mts. may perhaps prove to be synonyms.

Stenogyra ascendens Poey, renamed *B. assurgens* by Pfr., is stated by Poey to differ from *O. goodalli* by having the right margin ascending at the suture; the shell agreeing in other respects with *goodalli*. This was probably an individual feature, as no conspicuous ascent is noticeable in specimens sent out by Poey, or in Pfeiffer's figures, or in the Cuban specimens collected by myself in 1903. *B. pumilus* Pfr., from Havana or Matanzas provinces was based upon a small *O. goodalli*, as Pfeiffer himself recognized later. It measured 1.8 x .66 lines.

C. B. Adams included specimens of *O. goodalli* with some other species in his *B. pauperculus*. See under *Spiraxis*.

O. aciculæforme Miller is evidently a synonym. The original figures are copied, pl. 28, figs. 66, 67. "Shell scarcely perforate, subulate, straw-colored, with very arcuate fine striæ, but little shining; spire conic, the apex rather obtuse. Whorls 7½, nearly flat, parted by a lightly impressed suture, the last whorl two-sevenths the length. Columella straight. Aperture slightly oblique, ovate-oblong, acuminate above, receding below; peristome simple, the right margin straightened, receding above and below, columellar margin narrowly reflexed, adnate above; the margins subparallel. Length 7, diam. 2, aperture 2 x 1 mm. Distinguished from *O. rarum* by the flat whorls, the shallow and very oblique suture, the outer lip which is not arcuate above, and the growth-lines which above bend backwards to the suture; also by the slim, needle-shaped contour" (Miller).

Ecuador: Guayaquil (Wolf).

Antillean Species.

A few forms of *Opeas*, none of them well known, have been described from the West Indies, in addition to the generally distributed *O. gracile, micra, beckianum* and *goodalli*.

5. O. PLICATUM ('Guilding' Pfr.) *Unfigured.*

Shell *imperforate*, oblong, pale corneous, thin, pellucid, longitudinally closely plicate. Spire obtuse. Whorls 5, convex, the last a little shorter than the spire. Columella nearly straight. Aperture oval; peristome unexpanded, acute, the columellar margin shortly reflexed, *appressed*. Length 4, diam. 2 mill. Aperture 1¾ mill. long, 1 wide (*Pfr.*).

West Indies (coll. Metcalf).

Bulimus plicatus Guilding, PFR., Monographia Hel. Viv. ii, p. 170 (*Bulimulus plicatus* Guilding, MSS.)

Not figured, and known by the above description only.

6. O. SANTANENSE (Pfeiffer). Pl. 40, fig. 15.

Shell nearly imperforate, turrited, thin, slightly striatulate, covered with an olive-buff cuticle; spire regularly tapering, the apex acute; suture obsoletely crenulate. Whorls 9, convex, the last about two-sevenths the total length, rounded. Columella straightened. Aperture subvertical, truncate-oval; peristome simple, unexpanded, the columellar margin slightly reflected. Length 11, diam. 3.75, aperture 3 x 2 mm. (*Pfr.*).

Haiti: Pico de Santana in the Sierra Monte Cristi (Hjalmarson).

Bulimus santanensis PFR., Malak. Bl. v, 1858, p. 151, pl. 3, f. 14, 15; Monogr. vi, p. 97.—*Opeas s.*, CROSSE, J. de Conch. 1891, p. 150.

A conic-turrite shell with very short whorls, known by the unique type only.

7. O. ALABASTRINUM (Shuttleworth).

Shell very narrowly perforate, turrite-subulate, remotely costulate-striate, slightly shining, pellucid, white. Spire rather acute. Whorls 7 to 8, a trifle convex, the last scarcely one-fourth the total altitude. Suture deep. Columella straight. Aperture semiovate; peristome with the right margin slightly sinuous, the columellar margin reflexed, nearly closing the perforation. Length 7, diam. 2. 2, aperture 1.33 x .75 mm. (*Shuttl.*).

Porto Rico: San Juan, very rare (Blauner).

Stenogyra (*Opeas*) *alabastrina* SHUTTL., Diagnosen no. 6, p. 139, from Mittheil. naturforsch. Ges. in Bern, 1854, p. 47.—*Bulimus a.*, PFR., Monogr. iv, 460.

This very slender species has not been figured, and like the next, is known by the original description only.

8. O. GOMPHARIUM (Shuttleworth).

Shell very narrowly perforate, conic-turrite, remotely and irregularly plicatulate, slightly shining, wax colored. Spire rather acute, the apex obtuse. Whorls 6, a little convex, the last two-sevenths the total length; suture moderate. Columella straight. Aperture semioval; peristome with the right margin slightly sinuous, columellar margin very narrowly reflexed, nearly closing the perforation. Length 6.5, diam. 2.5, aperture 1.75 x 1 mm. (*Shuttl.*).

Porto Rico: San Juan, 3 specimens (Blauner).

Stenogyra (*Opeas*) *gompharium* SHUTTL., Diagnosen neuer Moll. no. 6, p. 139, in Mittheil. etc., 1854, p. 47.—*Bulimus g.*, PFR., Monogr. iv, p. 461.

SOUTH AMERICAN SPECIES.

Besides species 1 to 4 and 9 to 14, the *O. guatemalense* of Strebel (no. 20) has been reported from Colombia and Ecuador.

9. O. MARTENSI (Strobel). Pl. 29, fig. 86.

Shell subperforate, turrite, thin, hyaline, glossy; greenish buff-white; spire regularly tapering, the apex obtuse, suture deep. Whorls 7 to 8, a little convex, the first smooth, the rest very delicately striate, the last whorl scarcely one-third the total length, rounded basally. Aperture subrhombic-oval, not oblique; peristome simple, the margins joined by a very thin callus; columellar margin narrowly reflexed, basal margin somewhat rounded; columella straight, somewhat twisted in young specimens. Length maximum 20, minimum 9 mm. (*Strobel*).

Argentina: Palermo in the environs of Buenos Ayres, rare (Strobel).

Stenogyra martensi STROBEL, Materiali per una Malacos-

tatica di terra e di acqua dolce dell' Argentinia meridionale, 1874, p. 27, pl. 1, f. 5.

This form has, if the figure is correct, shorter whorls than *O. gracile,* while the general shape is similar to that species. An indigenous *Opeas* would hardly be expected to occur around Buenos Ayres; and I suspect that when specimens are compared, *O. martensi* will turn out to be one of the numerous aliases concealing *Opeas gracile.* The type figure is copied on my plate.

10. O. PELLUCIDUM (Pfeiffer). Pl. 29, fig. 80.

Shell subperforate, turrite, very thin, striatulate, glossy, pellucid, buff-corneous. Spire long, the apex obtuse. Whorls 7, a little convex, the last one-third the total length. Columella somewhat twisted; aperture squarish oval; peristome simple, acute the columellar margin shortly revolute.

Length 11.5, diam. 4, aperture 4 x 2 mm. (*Pfr.*).

Colombia: province of Merida (Funck; Cuming coll.).

Bulimus pellucidus PFR., P. Z. S. 1847, p. 231; Monogr. ii, p. 156.—REEVE, Conch. Icon. v, pl. 68, f. 487.

This shell seems to have the texture of the more lengthened *O. octogyrum.* I have not seen it.

11. O. OCTOGYRUM (Pfeiffer). Pl. 29, figs. 75 to 79.

Shell imperforate, subulate, thin, rather smooth, pellucid, waxy-whitish. Spire long, the apex obtuse; suture margined. Whorls 8, flattened, a little swollen at the suture; the last whorl about one-fourth the total length, slightly tapering basally. Aperture oblique, oblong, the peristome simple, unexpanded, the right margin arched forward above; columella thread-like, slightly arcuate. Length 12.5, diam. 2.66; aperture 3 x 1.5 mm. (*Pfr.*).

Venezuela: Caracas (E. Klocke).

Bulimus octogyrus PFR., Malak. Bl. iii, 1856, p. 45; Monogr. iv, 458.—*Opeas o.*, STREBEL, Beitrag Mex. etc., v, p. 107, pl. 7, f. 20, 6; pl. 17, f. 29.

"This species, according to Pfeiffer's type specimen (pl. 29, fig. 79), comes near to *O. subula* in general structure of the

whorls, but it is much more slender, with relatively larger embryonic whorls, and rather flat, little convex, proportionally lower whorls, at the same time having a distinctly marked sutnre. The sculpture is very inconspicuous, and hence the shell is rather glossy. The columellar reflection is distinctly developed, leaving an umbilical slit, and it has a thickening on the inner side below " (*Strebel*).

Strebel figures also a smaller form, 9.5 mm. long with 7½ whorls, also from Venezuela. Fig. 79 is a copy of Strebel's photographic figure of the type of *octogyrum*.

Stenogyra plicatella Guppy is identical with *octogyrum*, or at most may be distinguishable as a local variety. The description follows.

Var. plicatellum Guppy, (pl. 29, fig. 75). "Shell subulate, long-cylindric, subperforate, corneous, a little shining, sinuously striate; whorls 8 to 9, slowly increasing, a little convex, the last swollen; suture strong; aperture long, oval; peristome simple, a little sinuous above, the margins joined by a thin callus; columella straight, widely reflexed over the umbilicus.

" Length 13, diam. 3.5, height of aperture 3 mm.

"Length 15, diam. 3.5, height of aperture 2 mm.

"Length 9, diam. 2, height of aperture 1.5 mm." (*Guppy*).

Trinidad (Guppy, type loc.); Grenada and St. Vincent (Guppy, H. H. Smith); St. Lucia (Tate).

Bulimus octonoides Guppy, Ann. Mag. N. H. (3), xvii, 1866, p. 50, not of Adams.—*Stenogyra plicatella* Guppy, Ann. Mag. (4), i, 1868, p. 434; Proc. Scient. Asso. Trinidad 1869, p. 239; Journ. of Conch. vii, 1893, p. 213; P. Z. S. 1875, p. 320.—*Bulimus p.*, Pfr., Monogr. viii, p. 137.—*Opeas plicatella* Guppy, Crosse Journ. de Conch. 1890, p. 45, pl. 2, f. 2.—Smith, Proc. Malac. Soc. Lond. i, p. 308, 317, pl. 21, f. 15; Journ. of Conch. viii, p. 236.

In *O. octogyrum* the whorls are much flattened, especially the later ones, and they are *very oblique, the individual whorls being very high*. The striation is weak, quite unlike *O. subula* (*gracile*), consisting of arcuate irregular wrinkles of the very glossy surface. The axis is faintly visible through the shell.

Towards the apex there is some appearance of puckering below the suture. The spire tapers straightly and is slender above, as in typical *O. gracile*. The smooth apex is conspicuously obtuse. The aperture is oblique, long-ovate or piriform; and the columellar margin is rather narrowly reflexed, appressed except for a small crevice. A specimen before me was received from Mr. Guppy about 40 years ago. Three Trinidad specimens measure:

Length 13.5, diam. 3, aperture 3.2 mm.; whorls 8⅓.

Length 14, diam. 3.1, aperture 3.5 mm;. whorls 8½ (fig. 75).

Length 12.8, diam. 3, aperture 3.4 mm.; whorls 8.

A series before me from Demerara (pl. 29, figs. 76, 77) consists of smaller but evidently adult shells, imperforate or nearly so.

Length 10.2, diam. 2.5, aperture 2.9 mm.; whorls 7 (fig. 76).

Length 9.5, diam. 2.5, aperture 2.9 mm.; whorls 6¾ (fig. 77).

In other respects they are like the Trinidad shells. Some of them show irregularly scattered whitish spots due to incipient disintegration of the surface. Guppy has described a small form also from Trinidad.

Var. *amazonicum* n. var. Pl. 29, fig. 78.

Shell imperforate, *more slender* and elongate, but like *octogyrum* and *plicatellum* in the yellowish tint and in sculpture. Closely peppered with whitish dots. Length 10.2, diam. 2.2, aperture 2.5 mm.; whorls 8½. The type contains two large eggs in the penult. whorl. Para, Brazil (Dr. Hubbard).

12. O. RARUM Miller. Pl. 29, figs. 82, 83.

Shell narrowly perforate, oblong-turrite, thin, corneous, brownish above, very glossy; spire convexly conic, the apex rounded. Whorls 7, convex, parted by a deep suture, the last not a third the total length; columella somewhat twisted, receding below. Aperture oblique, suboval, strongly receding below; peristome simple, the right margin slightly arcuate, columellar margin narrowly reflexed adnate above. Length 8, diam. 2.6, aperture 2.5 x 1.5 mm. (*Mill.*).

Ecuador: Guayaquil (type loc., Dr. Th. Wolf); Guatemala and Eastern Mexico (Strebel).

Opeas rarum Mill., Malak. Bl. (n. F.), i, p. 125, pl. 14, f. 2 (1879).—Strebel, Beitrag Mex. etc., v, 1882, p. 103, pl. 17, f. 8, 17; pl. 7, f. 5.

Differs from *O. acutius* Mill. [*O. subula* Pfr.] by the wider shape, more convex whorls, narrower perforation, greater gloss, reddish color of the upper whorls, and the more strongly retracted base of the aperture. The very delicate growth-striæ are strongly arcuate. (*Mill.*).

Strebel remarks that Miller's type which he examined has not such terraced whorls as *O. octonoides,* and the last whorl is represented too full in Miller's figure (copied on my plate). The larger of Miller's two specimens measures 8.4 mm., with 6½ whorls. The whorls may increase in height and breadth a little faster than in *octonoides.* The shell is glossy, and has a sculpture more like *O. subula* than like *octonoides* or *lucidum,* the columellar reflection also resembling that of *subula* more than that of *caraccasense* [*beckianum*] or even *octonoides* [*micra*]. The same form according to Strebel was collected by Stark at San Miguel Jucumá, Guatemala. A form referred by Strebel to the same species as a "form B" was taken by him at the plantation Mirador (State of Vera Cruz). It is somewhat smaller, 7.2 mm. long with 6¾ whorls, the whorls are more distinctly terraced, and the sculpture is a little more sharply developed than in typical *O. rarum.*

It is not known to me by specimens.

13. O. camba (Orbigny). Pl. 27, figs. 50.

Shell much elongated, turriculate, thin, little transparent, smooth to the naked eye, but seen to be perceptibly striate under the lens; spire elongated, nearly conic, with obtuse apex; composed of 9 swollen whorls, quite wide and separated by a deep suture. Aperture oval, straight, with acute peristome, visibly reflexed, the columella flattened and recurved, leaving a sort of umbilicus. The general tint is dull white or a little brownish, the lip white with an indication of a light violet border. Alt. 14, diam. 4 mill. (*Orb.*).

Bolivia: Banks of the Rio Grande, province of Santa Cruz de la Sierra (Orb.), probably transported by water from the mountains.

Bulimus camba Orb., Voy. dans l'Amér. Mérid. p. 263, pl. 41, f. 15-17 (not pl. 34, f. 4-7=*B. munsterii*).—Pfr., Monogr. ii, p. 115, probably not *B. camba* of later volumes of the Monographia.—Not *B.* (*Peronaeus*) *camba* Paravicini, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino, ix, no. 181, p. 7.

This species is compared by d'Orbigny with *B. scabiosus* Sowb., but differs by its smoothness. The generic position is uncertain. Unknown to me. It has a more convexly conic spire than *O. gracile*, according to the figures.

14. O. mimosarum (Orbigny). Pl. 27, figs. 47.

Shell turriculate, short, thin, translucent, smooth or with a thick, deciduous epidermis usually marked with transverse lines; subumbilicate; spire swollen at the third of its length, towards the posterior extremity, and cylindric towards the mouth; apical end obtuse; whorls 9, close, narrow and not much raised. Aperture oval with acute margins. Color fawn-gray. Length 10, diam. 4 mm. (*Orb.*).

Bolivia: north side of the Rio Grande between that and the village of Pucara, at the foot of the Andes, province of Valle Grande, Dept. of Santa Cruz de la Sierra; found chiefly at the bases of mimosas (Orbigny).

Helix mimosarum Orb., Mag. de Zool. 1835, p. 20.—*Bulimus m.*, Orb., Voy. dans l'Amér. Mérid. Moll., p. 262, pl. 41, f. 12, 13, 14.—Pfr., Monogr. ii, p. 162; iii, 398; iv, 457; vi, 96. —Reeve, C. Icon. v, pl. 68, f. 484.

According to d'Orbigny this differs from *micra* by the closer and narrow whorls of the spire, the shorter, more pupoid shape, by the absence of striæ, the transversely striated epidermis, and finally by being double its size. It evidently stands close to *O. beckianum*, but differs by the absence of sculpture. Pfeiffer describes a specimen in Cuming's collection as 12 mm. long with 10 convex whorls.

15. O. glomeratum (Reeve). Pl. 27, figs. 51.

Shell conically subulate; not umbilicated; whorls 9, rounded,

smooth; sutures rather constricted; aperture nearly orbicular; lip simple; transparent horny. (*Rve.*).

Habitat unknown (Cuming coll.).

Bulimus glomeratus Rve., Conch. Icon. v, pl. 80, f. 591 (Dec. 1849).—Pfr., Monogr. iii, p. 366; iv, 435; vi, 75; viii, 105; Conchyl. Cab. p. 133, pl. 42, f. 36-38.

This form, which seems to belong close to *O. beckianum* and *O. mimosarum*, is still known by the original lot only. Pfeiffer gives another figure (pl. 27, fig. 48) and a more detailed description. "Shell subimperforate, oblong-turrite, thin, striatulate, pellucid, pale corneous; spire regularly tapering, the apex obtuse. Whorls 9, moderately convex, the last scarcely two-sevenths the total length, rounded basally; columella subarcuate; aperture diagonal, nearly semicircular; peristome thin, the margins somewhat converging, the right margin narrowly expanded, columellar margin very shortly reflexed, subappressed. Length 10, diam. 4 mm.; aperture 3 x 2 mm."

Species of Mexico and Central America.

Besides several widely spread species described above, and those following, an undescribed *O. torulosa* Morel. is credited to Panama in Nevill's Handlist Ind. Museum, i, p. 163. Strebel reports *O. rarum* (no. 12) from eastern Mexico.

16. O. argutum n. sp. Pl. 28, fig. 68; pl. 40, fig. 9.

Shell very narrowly perforate, tapering-oblong, very thin, corneous, subtransparent; spire slowly tapering to a very obtuse summit. Whorls 5½ to 6½, convex, the first 1¾ smooth, the rest densely, arcuately and *sharply striate*; the striæ obsolete on the *nearly smooth base* of the last whorl. Aperture subvertical, ovate; outer lip thin; columella vertical, weakly plicate obliquely near the base, its margin triangularly reflexed above.

Length 6.8, diam. 2.5, aperture 2 mm. (Orizaba).

Length 6, diam. 2.3, aperture 2 mm. (Orizaba).

Length 5.6, diam. 2, aperture 2 mm. (Texolo).

Mexico: Orizaba, 500 ft. above the town (Heilprin exped.); Texolo, State of Vera Cruz (S. N. Rhoads).

This species imitates the contour of *O. micra,* but it differs conspicuously from that in the dense, sharp sculpture. Fig. 68, of pl. 28 represents a specimen from Texolo, pl. 40, fig. 9, a larger one from Orizaba, type locality.

17. O. YUCATANENSE n. sp. Pl. 28, fig. 69.

Shell very narrowly rimate, cylindric-turrite, thin, pale yellowish corneous, subtransparent, the axis showing faintly through. Surface glossy, very finely, weakly striatulate. Spire straightly tapering to the very obtuse summit. Whorls 6½, tumid just below the deeply impressed suture, elsewhere moderately convex. Aperture subvertical, trapezoidal-ovate. Columella subvertical, with narrowly reflexed edge. Length 6.5, diam. 1.9, aperture 1.9 mm.

Yucatan: Ticul (Heilprin exped., 1890).

This cylindric-tapering form has a deep but narrowly impressed suture, the whorl below it rising steeply. The surface is more glossy than *O. gracile* and much less sharply striate. I have not been able to compare *O. rarum,* but with the same number of whorls that is a longer shell.

18. O. SEMISTRIATUM (Morelet). Pl. 29, figs. 84, 85.

Shell narrowly and deeply rimate, subelongate-conic, thin, minutely striate, hyaline, pale corneous-whitish. Spire oblong-conic, the apex rather obtuse. Suture deeply impressed. Whorls 7, a little convex, the embryonic 2 smooth, the third and fourth having rather wide-spaced riblets, which disappear on subsequent whorls; last whorl inflated, shorter than the spire; columella nearly straight, whitish. Aperture acuminate-oval, colored within like the outside; peristome simple, the margins joined by a thin callus; columellar margin dilated, partly covering the umbilicus, basal and outer margins acute. Length 12, diam. 5, aperture 4.5 mm. long, scarcely 3 wide (*C. & F.*).

Mexico: Forest of Palenque, in the State of Chiapas (Morelet).

Bulimus semistriatus MORELET, Testac. novissima ii, p. 10 (1851).—PFR., Monogr. iii, 441.—*Bulimulus s.,* CROSSE et FISCHER, Moll. Mex. p. 555, pl. 20, f. 14, 15 (description and figures of type).—*Opeas s.,* MARTENS, Biologia, p. 296.

"This little species is chiefly characterized by the riblets observable on some of the whorls of the spire, usually the third and fourth, and which wholly disappear on the last or penultimate whorls" (*C. & F.*).

19. O. BOCOURTIANUM (Crosse et Fischer). Pl. 29, figs. 87, 88.

Shell imperforate, subelongate-turrite, thin, translucent, slightly striatulate, nearly smooth, pale corneous-whitish. Spire long, the apex obtuse; suture impressed. Whorls 8, rather flattened, the embryonic 2 smooth, whitish, the last whorl much shorter than the spire (as 2 to 7). Aperture subvertical, oblong-oval; peristome simple, unexpanded, the margins remote, columellar margin a trifle dilated, basal and outer margins acute. Length 9, diam. 2, aperture 2 x 1.25 mm. (*C. & F.*).

Guatemala: Province of Vera Paz (Bocourt; Paris Mus.), in stomach of *Glandina plicatula*.

Stenogyra bocourtiana C. & F., Journ. de Conchyl. xvii, 1869, p. 424.—*Bulimus b.*, PFR., Monogr. viii, p. 136.—*Opeas b.*, C. & F., Moll. Mex. p. 602, pl. 26, f. 8.—MARTENS, Biologia, Moll., p. 292, with var. *pittieri*, pl. 17, f. 6 (1898).

"Distinctly broader and more conical than *O. subula.*"

Var. *pittieri* Martens. Pl. 29, fig. 90.

"Somewhat broad, glossy, diaphanous, distinctly striate; whorls a little more convex, 7 only; general shape as in *O. bocourtianum*; umbilicus almost closed, punctiform; columella somewhat twisted. Length 10, diam. 3, aperture 3.5 x 2 mm." (*Martens*). Central Costa Rica at La Palma, 1500 meters above the sea, beneath tuna plants (cactoids). (*Pittier*).

20. O. GUATEMALENSE Strebel. Pl. 29, fig. 91.

Shell rather strong, rather glossy, light yellowish corneous and translucent. The sculpture consists of somewhat irregularly strong, very fine, closely crowded folds. The first 1¼ whorls form a cupola, the following increase in width very slowly, are but little convex, and are weakly step-like at the deep suture; the last has a weak callus deposit on the aper-

tural side at the lower half. Length 10.8, diam. 3, aperture 2.5 x 1.3 mm.; whorls 8½. (*Strebel*).

Guatemala: Coban (Sarg, type loc.); Antigua, on moist walls (Stoll). Also along the Rio Coto in the Golfo Dulce, Costa Rica (Pittier).

Opeas guatemalensis Strebel, Beitrag Mex. Land- und Süsswasser-Conchyl. v, 1882, p. 105, pl. 7, f. 2a.—Martens, Biologia p. 293, with var. *majus,* pl. 17, f. 7.

This form differs from *O. subula* as follows: the shell is less acuminate, the whorls are comparatively lower, increase more slowly in breadth, and are less convex; the last is weakly keeled, and in dorsal view appears not so tapering downwards. The sculpture is not so sharp and is somewhat more irregular (*Strebel*).

Strebel also reports a form of the species from Colombia, of somewhat wider contour, especially below, and with somewhat coarser sculpture (*Beitrag* pl. 7, f. 3; pl. 17, f. 26). He also reports it from Ecuador.

Var. *majus* Martens. Pl. 29, fig. 89.

Very solid, pale yellowish, somewhat shining, finely striated; whorls 9, somewhat angulate and whitish at the suture, which is rather deep. Columellar margin of the aperture straight, vertical, broad, provided with a very fine fold, which runs from inside obliquely to the middle of the outer margin. Length 15, diam. 3.5, aperture 3.5 x 2 mm.; whorls 9. (*Martens*).

W. Guatemala: Miramar, near San Francisco, in the Costa Cuca (Stoll).

21. O. gladiolus Crosse et Fischer. Pl. 29, figs. 93.

Shell covered-rimate, long, subulate-turrited, thin, slightly striatulate, diaphanous, pale waxy-whitish. Spire much lengthened, the apex rather obtuse, suture much impressed. Whorls 12, rather flat, the embryonic 2 smooth, the last whorl much shorter than the spire, tapering basally. Aperture subvertical, subovate, colored within like the outside; peristome simple, unexpanded, the margins remote, columellar margin somewhat dilated, covering the umbilical crevice in part,

basal and outer margins acute. Length 14.5, diam. 2.5, aperture 2 x 1.25 mm. (*C. & F.*).

Guatemala (F. Sarg).

Opeas gladiolus C. &. F., Journ. de Conchyl. xxv, 1877, p. 272; Moll. Mex. i, p. 604, pl. 26, f. 10.—MARTENS, Biologia, p. 293, pl. 17, f. 8 ? (Merida, Yucatan).

This species, of a very elongate shape with many nearly flat whorls, seems very distinct from its congeners in Mexico and Guatemala. It is not without similarity to *O. colimense*, but it is more slender, more subulate, the whorls are more numerous, proportionately smaller, and the aperture is not so large (C. &. F.).

22. O. COLIMENSE (Crosse et Fischer). Pl. 29, figs. 92, 94.

"Shell with an almost closed umbilical crevice, long-turrited, thin, translucent, with fine longitudinal striæ, pale corneous-whitish, with inconspicuous transverse whitish lines which sometimes disappear. Spire long, the apex obtuse. Suture much impressed, deep, whitish. Whorls 10, not very convex, the first two smooth, the last much shorter than the spire. Aperture subvertical, oblong-ovate; peristome simple, unexpanded, the margins distant, the columellar margin a little dilated, basal and outer margins acute. Length 15.5, diam. 3.25, aperture 3 x 2 mm." (*C. & F.*).

State of Colima, S. W. Mexico (Xantus, type loc.); Cordova, State of Vera Cruz (Höge).

Stenogyra colimensis C. & F., Journ. de Conch. xvii, 1869, p. 424.—*Opeas c.*, C. & F., Miss. Sci. au Mex., Moll. i, p. 603, pl. 26, f. 9.—Martens, Biologia, Moll., p. 293.

This species is notable for its length, the spire tapering regularly as in *O. gracile*, but composed of shorter, more convex whorls. The spiral whitish lines mentioned by Crosse and Fischer are probably due to incipient disintegration of the cuticle, letting air into it. They are present to some degree on three of the four specimens I have seen, being most conspicuous on the last whorl. The largest one before me measures, length 14, diam. 3.2, aperture 3 mm., whorls 9¾.

23. O. ADAMSI n. sp. Pl. 50, fig. 18.

Shell minutely perforate, subcylindric, thin but moderately strong, milky-corneous, somewhat translucent. Surface sculptured with excessively fine, close striæ, which are slightly arcuate and a little oblique. Whorls 8⅓, quite convex, the later ones a little flattened in the middle; suture very deeply impressed. Base of the last whorl very convex. Aperture slightly oblique, small, rhombic-ovate. Outer lip arched forward a little above. Columella slightly concave, dilated above. Length 8.9, diam. 2, length of aperture 2 mm.

Panama (C. B. Adams). Type in coll. Amherst College.

This very slender and narrow species is related to *O. colimense*, which is larger, more tapering and more coarsely striatulate. It is named in honor of Professor C. B. Adams.

Genus PSEUDOPEAS Putz.

See p. 114. The following species has the embryonic shell-sculpture and viviparous reproduction of this African genus.

P. VIVIPARUM (Miller). Pl. 29, fig. 81.

"Shell rimate, thin, glossy, diaphanous, fulvous, ribbed; spire turrite, the apex rounded; whorls 5½, convex the first minutely decussate, very rapidly increasing, the following whorls ribbed, the ribs acute, arcuate, sometimes split, the intervals flat, twice the width of the ribs; last whorl flattened at the periphery, not half the total length. Columella straightened. Aperture acuminate-oval, not oblique; peristome simple, acute, receding above, the columellar margin angularly reflexed, dilated, adnate above; margins subparallel, joined by a parietal callus. Length 6, diam. 3, aperture 2.5 x 1.5 mm." (*Mill.*).

Ecuador: Val de Pilaton, over 1000 meters above the sea, on leaves (Boetzkes).

Opeas viviparum MILLER, Malak. Blätter xxv, 1878, p. 197; and neue Folge i, 1879, pl. 6, fig. 4.

The single specimen examined by Miller contained the viscera, in which two embryo shells were found. They consist of 1½ whorls, with very delicate, close spiral striation.

Genus TRISTANIA Boettger.

Tristania Bttg., Systematisches Verzeichniss der lebenden Arten der Landschnecken-Gattung Clausilia Drap, in 17r. und 18r. Bericht Offenbacher Vereins für Naturkunde, 1878, p. 19. Not *Tristania* Kirby, 1892.

Shell sinistral, perforate, oblong-turrite, pale brown, composed of 6½ to 8½ convex whorls; apex obtuse, smooth and rounded. Aperture ovate, peristome simple, thin, the columellar margin well expanded, parietal callus thin.

Soft anatomy unknown. Type *T. tristensis.*

The reference of this group to the Palæarctic genus *Balea* was evidently due to its turrite shape and sinistral coil. Its rank and position are uncertain, pending information on the soft anatomy, but a place near *Opeas* seems indicated by the characters now known. No sinistral *Opeas* has been described, but throughout the *Achatinidæ* there are occasional sinistral species or groups among the dextral forms.

Neither species has been adequately illustrated. Boettger had apparently not seen them. He gave no diagnosis of *Tristania.*

1. T. TRISTENSIS (Gray). Pl. 40, fig. 10.

Shell subulate-ovate, reddish-brown, axis .4, diam. .1 of an inch (*Gray*).

"This species is more slender and longer than *B. ventricosa*, and has one and at times two additional whorls, which are more convex and more slowly enlarging. The characters of the sculpture, of the umbilicus, and aperture are very alike in both forms, the latter of course being shorter in proportion to the total length of the shell." (*E. A. Smith*).

Tristan d'Acunha (Capt. Carmichael; Challenger).

Balea tristensis Leach Mss., Gray, Zoological Journal i, p. 62-63, pl. 6, f. A (1825).—Pfr., Monogr. ii, p. 388.—*Pupa tristensis* Gray, Ann. of Philos. 1825, ix, p. 413.—*Balea* (*Tristania*) *t.*, Smith, P. Z. S. 1884, p. 279.

2. T. VENTRICOSA (Gray). Pl. 40, fig. 11.

Shell lanceolate-ovate, pale brown, axis .3, diam. .1 of an inch (*Gray*).

"This species has not, as far as I can ascertain, ever been fully characterized, the diagnosis of Gray, consisting of five words only, being totally inadequate. It may be described as pupiform, pale olive-brown, narrowly rimate, sculptured with rather strong oblique lines of growth. The whorls are six and a half to seven in number, rather rapidly enlarging, convex, divided by a deep oblique suture. The spire has curved outlines, and terminates above in an obtuse rounded, smooth apex. The aperture is rather large, and occupies somewhat less than a third of the total length. The peristome is thin, narrowly reflexed on the left of the aperture, and rather broadly expanded in the umbilical region, and has the extremities, which converge but very slightly, connected by a thin callus spread over the whorl. Length 8 mm.; diam. 3½; length of aperture 2⅓, width 2." (*E. A. Smith.*)

Tristan d'Acunha (Capt. Carmichael); Inaccessible Island, Tristan d'Acunha (Challenger Exped.).

Balea ventricosa Leach Mss., Gray, Zoological Journal i, p. 62, pl. 6, f. B.—Pfr., Monogr. ii, p. 389.—*Pupa v.*, Gray, Ann. of Philos. ix, 1825, p. 413.—*B.* (*Tristania*) *v.*, Smith, P. Z. S. 1884, p. 278.

Genus LUNTIA E. A. Smith.

Journal of Conchology ix, p. 28, Jan. 1898, for *L. insignis.*

"Shell elongate, slender, imperforate; columella twisted, obliquely truncate in front, covered with a reflexed callus; outer lip conspicuously sinuate above at the suture, slightly thickened below the sinus" (*Smith*).

"This genus of *Stenogyridæ* is allied to *Subulina,* but is distinguished by the sinus at the upper part of the labrum." (*Smith*). The single species is from Trinidad.

1. L. insignis Smith. Pl. 40, fig. 7.

Shell small, long, slender, imperforate, white, the apex mammillate. Whorls 7, the first two large, smooth, the rest convex, sculptured with delicate arcuate riblets, more or less running out below, projecting above at the sutures. Aperture small, inversely auriform; columella arcuate twisted

below, obliquely truncate, covered with a rather thick white callus which joins the lip above. Outer lip projecting in the middle, deeply sinuated above, slightly thickened below the sinus. Length 5.5, diam. 1.33, aperture 1.33 x 1 mm. (*Smith*).

Trinidad (J. H. Ponsonby).

Luntia insignis Sm., Journ. of Conchology ix, p. 28, fig. 8 (Jan. 1898).

"The slender costæ being produced above, give the suture a crenulated appearance, and below, as a rule, they do not extend quite across the whorls. The columellar callus is very thick, the upper part almost forming a tubercle" (*Smith*).

Genus TORNAXIS von Martens.

Biologia Centrali Americana, Mollusca, p. 311 (April, 1898), for *T. singularis.*

"Shell turrite, imperforate, vertically costulated, not shining, many-whorled, not keeled; aperture ovate, external margin simple, arcuate; columellar margin very thick, strongly twisted, separated by a deep and narrow notch from the basal margin. Anatomy not yet known.

"This genus possesses to a certain extent the characters of both *Subulina* and *Spiraxis* as regards the form of the aperture, but in its general aspect it approaches nearer to *Rhodea* H. & A. Adams, from which it only differs in the absence of the prominent spiral keel in the terminal whorls.

Named from *axis*, and *tornare*, to turn on a lathe; analogous to *Spiraxis*" (*v. Mts.*).

This genus resembles *Luntia* in its thick columellar callus, notched base and costulate surface, but differs by the simply arcuate outer lip, not deeply sinuate above. Soft anatomy and embryonic whorls unknown.

1. T. singularis Martens. Pl. 40, fig. 16.

"Shell cylindrically turrite solid, with vertical narrow costæ, separated by interstices which are from two to four times as broad as the costæ, of dull greenish color. Whorls very convex, with simple linear sutures, six in number in the only specimen obtained, which is broken above (there are,

no doubt, considerably more in perfect examples) ; last whorl rounded in the periphery, somewhat concavely attenuated and produced at the base. Aperture distinctly oblique, asymmetrically ovate, acute above, regularly arcuated at the outer side, sinuous in the form of an S on the columellar side, rounded at the base; external margin thin, simple, arcuate; columellar margin formed by a strong, thick, white, spirally twisted line, which enters above into the interior of the aperture, and is terminated at the base by a vertical narrow notch. Length (of the injured shell) 11 mm., diam. including the aperture 3, diam. of the penultimate whorl 2½; aperture 2½ mm. long, 1½ broad. Last whorl, seen from the dorsal side, one-third of the length of the six preserved whorls united." (*v. Mts.*).

E. Guatemala: Panzos (Conradt).

Tornaxis singularis Marts., Biol. Centr. Am. Moll., p. 311, pl. 18, f. 6 (April, 1898).

"In the unique specimen the costæ are rubbed down here and there, and the hole of the upper breach is open, which proves that the upper whorls have not been lost during life."

Genus SUBULINA Beck, 1837.

Subulina Beck in part, Index Moll. p. 76.—Herrmannsen, Indicis Gen. Malac. ii, p. 522 (Feb. 1849).—Gray, P. Z. S. 1847, p. 177, 178, and of most modern authors.—*Macrospira* Swainson, in part, Shells and Shell-fish, p. 335, for *octona* auct. and *aperta* Gldg. (1840).—*Stenogyra, Achatina* and *Bulimus* of older authors.

For generic description see p. 71. In America *Subulina* inhabits nearly the whole tropical region, but there are very few species.

The shell is very similar to that of the agnathous group *Pseudosubulina,* but the latter is generally more strongly sculptured with vertical riblets.

Subulina differs from *Homorus* by its clear, more or less transparent shell, without dark streaks, and by the generally smaller size and narrower contour. It must be admitted that at present the two groups are retained as separate genera on

very unsatisfactory characters. Probably the clear Abyssinian forms belong to *Subulina* rather than to *Homorus*. One species temporarily referred to this genus, *S. vivipara* (p. 80) brings forth living young, but the typical Subulinas of America and West Africa are oviparous. A sub-genus *Nothapalus* has been erected by Von Martens for the African *S. paucispira*, p. 95. It is likely that *S. bicolumellaris* (p. 90) will be removed from *Subulina*, at least as a subgenus. Among American forms the most remarkable is *S. stolli*, which has large protuberances on the embryonic whorls.

Beck originally proposed the name *Subulina* for the following species: (1) S. cyanostoma Rüpp., (2) turritellata Dh., (3) striatella Rang., (4) malaguetana Rang., (5) monoceros Bck., (6) propinqua Beck, (7) terebraster Lam., (8) octona Ch., (9) crotalariæ Schum., (10) carinulata Beck, (11) pupæformis Beck, (12) S. ? sericata Beck.

The first species of the list was made type of *Homorus* by Albers, 1850; Species 6, 10, 11, 12 are nude names; 7 is an *Obeliscus*; 2 and 4 are species of uncertain generic relationships; leaving species 3, 5, 8, 9 to represent the group of *S. octona*. Gray in 1847 and Herrmannen, 1849, agreed in selecting as type of *Subulina* the commonest and best known species, *S. octona*—a course approved by practically all later writers who have recognized the group.

Key to American Species.

I. Embryonic whorls smooth except for subsutural crenulation.

a. Surface smoothish, only irregularly wrinkled or striatulate.

b. Whorls quite convex; columella very concave above; 15-24 mm. long, with 8-10 whorls. *S. octona*, no. 1.

bb. Similar, 11 x 3.5 mm. with 7 whorls; Peru. *S. yatesi*, no. 2.

bbb. Columella slightly twisted, obliquely truncate below; 11.5 x 3.3 mm., whorls 7. *S. confusa*, no. 3.

bbbb. Shell slender, the columellar margin but slightly concave; 21 to 25 mm. long, 4.5 to 5 wide, with 9½ whorls. Mexico.
S. porrecta, no. 5.

aa. Surface very densely, finely striate; aperture as in *S. octona*; 9 x 3 mm. with 6¾ whorls. Para.
S. parana, no. 4.

aaa. Surface with distant, inconspicuous riblets; 8 x 2 mm. with 11 whorls. Guatemala.
S. cylindrella, no. 6.

II. Embryonic whorls with large protuberances, the rest sculptured with delicate, close vertical riblets. Guatemala.
S. stolli, no. 7.

1. S. OCTONA (Bruguiere). Pl. 39, figs. 28 to 37, 39, 40.

Shell imperforate, thin, translucent, yellowish-corneus, turrite, regularly tapering to the obtuse summit, very glossy, irregularly wrinkle-striate. Whorls 9 to 11, quite convex, parted by a deep and in places irregularly crenulate suture, the first 2½ or 3 whorls regularly crenulated by a series of short, fine subsutural folds. Aperture small, ovate, somewhat oblique; outer lip thin; columella concave above, obliquely and deeply truncate at its base.

Length 21.5, diam. 5, aperture 4.7 mm., whorls 10 (S. Domingo).

Length 22.9, diam. 5, aperture 4.3 mm., whorls 11 (S. Domingo).

Length 20, diam. 4.4, aperture 4 mm., whorls 9½ (S. Souci).

Length 21, diam. 4.2, aperture 4 mm., whorls 10 (Tabasco).

Tropical America. I have examined specimens from the following localities: Antilles: Bermuda; Nassau N. P., Bahamas; Havana, Matanzas and Cienfuegos, Cuba; Port Antonio, Blackstone R. and Porus, Jamaica; Jeremie, Charmattes, Cape Hatian, Sans Souci and S. Domingo City, Haiti; Porto Rico; Vieques, St. Thomas, St. John, Antigua, Tortola, St. Bartholomew, Guadeloupe, Dominica, Barbados. South

America: Trinidad, La Guayra and Puerto Cabello, Venezuela; Para, Brazil. North America: Nicaragua, Costa Rica, Yucatan, San Juan Bautista, Tabasco. Introduced at Miami, Florida, and in hothouses in Philadelphia, etc. For additional records of American localities see references below.

Helix octona Indiæ Occidentalis CHEMNITZ, Conchyl. Cabinet, ix, p. 190, pl. 136, f. 1264 (1786). Not *Helix octona* Linné, *cf.* Hanley, Ipsa Linn. Conch. p. 381.—*Bulimus octonus* BRUG., Encycl. Méth. i, p. 325 (1792).—*Achatina octona* ORB., Moll. Cuba i, p. 168, pl. 11, f. 4-6; Voy. Amér. Mérid. p. 260 (Guayaquil).—PFR., Monographia Hel. Viv. ii, 266; iii, 501; iv, 613; vi, 233; Conch. Cab. p. 342, pl. 37, f. 19, 20, (references to early literature).—HIDALGO, Viaje al Pacifico, p. 138.—*Macrospira octona* SWAINS., Malacol. p. 335.—*Sira octona* SCHMIDT, Stylommat. pp. 5, 42.—*Stenogyra octona* Chemn., MAZE, Journ. de Conch. 1883, p. 5, 41, 47, 51; 1890, p. 22 (Guadeloupe and its dependencies); 1874, p. 158 (Martinique).—BINNEY, Ann. N. Y. Acad. Sci. iii, p. 100, (teeth, Bahia specimen).—GUPPY, P. Z. S. 1875, p. 320 (Trinidad).—TATE, Ann. Mag. N. H. (4), iv, 1869, p. 356 (St. Lucia).—MARTENS, Binnenmoll. Venezuelas p. 35 (Puerto Cabello, Caracas).—VON MARTENS, Biologia Centrali Americana, Moll., p. 298, 638 (Vera Cruz, Mex.; many places in Central America, etc.), with var. *strebeli*, p. 299, based upon Strebel, Beitrag, p. 116, pl. 7, f. 16 (Campeche).—*Subulina octona* SMITH, Proc. Malac. Soc. Lond. i, p. 309, 317, 322 (St. Vincent, Grenada, Mustique, H. H. Smith).—CROSSE, Journ. de Conch. 1891, p. 150 (Haiti, around Jeremie, Weinland, and Dondon, Rolle); Journ. de Conch. 1892, p. 29 (Porto Rico at San Juan, Fajardo, Ceiba, Humacao, Luquillo, Vieques).—ANGAS, P. Z. S. 1883, p. 594 (Dominica); 1879, p. 485, pl. 40, f. 16 (Costa Rica).—PILSBRY, Nautilus vi, 107, viii, 137 (Greenhouses in Phila.).—COUSIN, Bull. Soc. Zool. France 1887, p. 241 (synonymy, dist. in S. Amer.).—*Achatina trochlea* PFR., Symbolæ ad Hist. Hel. ii, p. 59, 1842 (Mexico); Monogr. ii, p. 266; Conchyl. Cab. p. 343, pl. 37, f. 23, 24.—*Subulina trochlea*, STREBEL, Beitrag v, p. 115, pl. 7, f. 16 (left fig.), pl. 17, f. 32; pl. 18, f. 1, 12-16, 18-24 (anatomy).

S. octona var. *trochlea* Martens, Biologia, p. 299, pl. 17, f. 13.—*Subulina guayaquilensis* Miller, Malak. Bl. n. F. i, p. 126, pl. 13, f. 5 (1879); *cf.* Strebel, Beitrag Mex. v, p. 116.—? *Subulina monoceros* Beck, Index Moll. p. 77, with var. *colombiensis* and *boliviana*, not described, but said to = *H. octona* var. *a* d'Orb.—*Achatina novenaria* Anton, Verzeichniss, p. 44, no. 1601.—*Achatina panamensis* Muhlfeldt in coll. according to Pfeiffer.

Bruguiere's description of this species is not convincing but in the absence of incontrovertible data showing that he had some other species, it would be pedantic to change the name. He refers to Chemnitz's figures which doubtless represent what we now know as *octona*. No measurements are given. It is a common species in Guadeloupe and "Saint Domingue," the type localities cited by Bruguiere. In many but not all Antillean specimens, the subsutural crenulation of the embryonic shell is less conspicuous than in most continental shells. After carefully going over a collection of some thousands of shells from a great many places, I can find no adequate ground for the erection of subspecies or local varieties, though there is considerable variation, as shown in the figures. Pfeiffer's *A. trochlea* (pl. 39, fig. 40) is merely a large specimen, 23 x 5 mm., with 10 whorls. Var. *strebeli* Martens (pl. 39, fig. 36) described as "somewhat longer, 25-26 mm., with more whorls, 11-12, and a comparatively small aperture," from the court of a house at Campeche, is evidently only a well-grown individual. *Subulina guayaquilensis* Miller was based upon a large form of *S. octona*, measuring length 22, diam. 4, aperture 3.5 x 2.5 mm., with 11 whorls. It was found in quantity in gardens at Guayaquil, Ecuador. It has absolutely no claim to specific distinction.

Specimens are figured from Santo Domingo City pl. 39, figs. 28, 29; Puerto Cabello, Venezuela, figs. 30, 31, 32; Morant Bay, Jamaica, fig. 33; San Juan Bautista, Tabasco, fig. 34; Izamal, Yucatan, fig. 35; Sans Souci, near Cape Haitian, fig. 37, and a drawing of the living animal by Gabb, Costa Rica, fig. 39.

2. S. YATESI (Pfeiffer).

Shell turrite, rather thin, lightly striatulate, diaphanous, waxen; the spire regularly tapering, apex obtuse; suture deep. Whorls 7, convex, the last slightly over one-fourth the total length, subangular below the middle. Columella arcuate, obliquely distinctly truncate. Aperture slightly oblique, oval-rounded; peristome simple, unexpanded. Length 11, diam. 3.5, aperture 3 x 2 mm. (*Pfr.*).

Peru: Moyobamba (Yates, in Pfr. coll.).

Achatina yatesi PFR., P. Z. S. 1855, p. 99; Monographia iv, 613.

An unfigured form, somewhat smaller than *S. octona* though no very tangible differential characters are given in the diagnosis to separate *Yatesi* from that common species in an immature stage.

3. S. CONFUSA (Pfeiffer). Pl. 40, fig. 6.

Shell elongate, subcylindric, striatulate, glossy, pellucid, greenish-hyaline. Spire elongate, the apex tapering in a short cone. Whorls 7, a little convex, the last a little exceeding one-fourth the total length, subcompressed laterally. Columella lightly twisted, obliquely truncate at base. Aperture oblique, subrhombic-oval; peristome simple, unexpanded. Length 11.5, diam. 3.33, aperture 3 mm. long (*Pfr.*).

Habitat unknown (Mus. Cuming).

Achatina confusa PFR., Zeitschr. f. Malak. 1852, p. 63; Monogr. iii, 501.—*Bulimus bacterionides* SOWERBY, Conch. Illustr. f. 83.—REEVE, Conch. Icon. v, pl. 68, f. 482 (not of Orbigny).

Orbigny's *B. bacterionides* is apparently referable to *Obeliscus,* while the shell figured under that name by Sowerby and Reeve seems to be a *Subulina.* Like the preceding species, this still needs elucidation. Reeve's figure is copied.

4. S. PARANA n. sp. Pl. 40, fig. 8.

Shell imperforate, turrite, thin, corneous, often faintly brown-tinted on the spire. Surface glossy, very densely and finely striate, the striæ weaker on the base, and absent on the two apical whorls, where they are represented by a fine

delicate plication below the suture. Spire straightly tapering, the summit obtuse. Whorls 6¾, convex, parted by a delicately crenulate suture. Last whorl weakly subangular at the periphery. Aperture ovate, slightly oblique. Outer lip thin and sharp as usual. Columella concave above, obliquely truncate near the base, sigmoid in an oblique view in the mouth. Length 9, diam. 3, aperture 2.8 mm.

Brazil: twenty miles below Para. Cotypes in coll. A. N. S. P. and J. Ritchie, Jr.

This species is closely related to *S. octona* but differs constantly by its closely, finely striate surface, somewhat resembling the West African forms. It probably attains a greater size.

5. S. PORRECTA Martens. Pl. 39, figs. 23, 24, 25.

Shell imperforate, cylindric-subulate, rather solid, lightly striatulate, yellowish-waxen, moderately glossy, unicolored, the apex globular. Whorls 9½, the upper ones a little convex, the lower flattened, slightly wider than high, the last whorl higher than wide, gradually tapering basally. Aperture long-ovate, the columellar margin slightly concave, very obliquely truncate towards the base. Length 21 to 25, diam. 4.5 to 5, aperture 4.5 x 2 to 4.66 x 2.5 mm. (*Marts.*).

Mexico: Teapa, State of Tabasco (H. H. Smith).

S. porrecta MARTS., Biologia p. 300, pl. 17, f. 14 (April, 1898).—*S. trochlea* in part. FISCHER & CROSSE, Miss. Sci. Mex., Moll. i, p. 642, pl. 25, f. 14 (Yucatan).

"Distinct from *S. octona* and its variety *trochlea* chiefly by the more slender and less convex form of the last whorls, and the scarcely concave columellar margin" (*Marts.*).

6. S. CYLINDRELLA (Morelet). Pl. 39, figs. 26, 27.

Shell subulate-turrite, irregularly sculptured with distant, not very conspicuous riblets, thin, hyaline, pale corneous. Spire long, the apex obtuse, rounded; suture impressed. Whorls 11, a little convex, the first two smooth, the last much shorter than the spire, not one-fourth the total length, the base nearly smooth, aperture subovate; peristome simple, pale corneous, the margins disjoined, columellar margin short, sub-

arcuate, obliquely a little truncate, the basal and outer margins acute. Length 8, diam. 2, aperture 1.5 x 1 mm. (*Crosse et Fisch.*).

Guatemala: woods of Peten, near San Luis. (Morelet).

Achatina cylindrella Morelet, Test. Noviss. ii, p. 12 (1851). —Pfr., Monogr. iii, p. 502.—*Subulina c.*, Crosse et Fischer, Miss. Sci. Mex., Moll., p. 634, pl. 25, f. 13.—Martens, Biologia, p. 300.

"Distinct from the species of *Pseudosubulina* by the less numerous costæ with large interstices, and by the form of the columellar margin which agrees very well with that of *S. octona*. The only specimen seen (and figured) by Crosse and Fischer is not quite full grown, so that the form of the columella in the adult is not quite certain.

7. S. stolli Martens. Pl. 39, figs. 20, 21, 22.

Shell imperforate, long-turrite, rather thin, sculptured with delicate, close, vertical riblets, rather glossy, whitish, unicolored, the apex obtuse. Whorls 11, the first two marked with some smooth protuberances, the following whorls a trifle convex, with rather deep, somewhat irregular and incrusted suture, last whorl rapidly tapering basally, smooth. Aperture oblong-elliptical, the outer margin lightly arcuate, basal margin short, columellar deeply concave, distinctly truncate at the base. Length 24, diam. 5.5, aperture 5 x 3.5 mm. (*Marts.*).

Guatemala: Vera Paz (Stoll).

S. stolli Marts., Biologia Centrali Amer. p. 300, pl. 17, f. 15.

"General form a little more conical than in *S. octona*, from which it is well distinguished by the sculpture. The strong protuberances on the first two whorls are very peculiar" (*Marts.*).

Genus SYNAPTERPES Pilsbry, 1896.

Synapterpes Pils., Nautilus x, p. 46, August, 1896, type *Bul. hanleyi* Pfr. — *Oxycheilus* Albers, Die Hel., p. 174 (1850), not *Oxychilus* Fitzinger, 1833, nor *Oxycheila* Dej., 1825.—*Orphnus* and *Bulimus* sp., auct.

Shell rimate or imperforate, ovate-turrite, thin, glossy, composed of 7 or 8 whorls, which are crenulated below the sutures, the embryonic whorls smooth, summit obtuse but not bulbous, with a comma-shaped apical dimple. Aperture long-ovate, with thin, sharp outer lip; columella slender, strightened above, broadly concave below, not truncate, its edge narrowly reflexed above. Type *S. hanleyi.*

The soft anatomy is not known, with certainty. Mr. W. G. Binney has described the jaw and teeth of *hanleyi* and figured the latter, as similar to *Strophocheilus*; but the conchological features of the snail are so at variance with this result that I am disposed to think that some misidentification or inadvertent exchange of radulæ in mounting may have occurred.

The genus differs from *Obeliscus* by its long-ovate shape, smaller number of whorls, and deeper apical dimple. The shell unites the Bulimoid form and the Stenogyroid texture.

The genus is somewhat heterogeneous, but I feel that little progress can be made towards a more natural grouping until we have more knowledge of the South American fauna. The following subgenera may for the present be recognized.

Synapterpes s. str.—Embryonic shell smooth; aperture Bulimoid, the columella entire below. Species 1-3.

Promoussonius.—Embryonic whorls large and arcuately rib-striate, the rest decussate; columella entire. Species 4.

Chryserpes.—Embryonic whorls smooth; columella with a small spiral fold below; shell glossy, subtranslucent. Species 5-7.

Zoniferella. — Shell glossy, greenish-black with a white peripheral band; aperture Bulimoid. Species 8, 9.

1. S. hanleyi (Pfeiffer). Pl. 37, figs. 87, 88.

Shell subimperforate, oblong-subfusiform, thin, pellucid, uniform brown. Spire long, rather acute; whorls 7, rather flattened, crenulate-striate at the impressed suture, the last whorl obliquely descending, about two-fifths the total length. Columella nearly straight. Aperture oblong-oval, light blue

inside; peristome simple, unexpanded, the columellar margin narrowly reflexed, leaving a very narrow perforation. Length 51, diam. 17.5, aperture 23 x 11.5 mm. (*Pfr.*).

Brazil (Miller, Besecke *et. al.*).

Bulimus hanleyi Pfr. in Philippi, Abbild. und Beschreib. neuer Conch. ii, p. 111, pl. 4, f. 2 (August, 1846); Monogr. ii, p. 171; Conchyl. Cab. p. 222, pl. 61, f. 9, 10.—Reeve, C. Icon. v, pl. 30, f. 181.—Pilsbry, Nautilus x, p. 46.—*Orphnus hanleyi* Binney, Proc. A. N. S. Phila. 1874, p. 62, Ann. N. Y. Acad. Sci. iii, p. 115, pl. 11, f. D (jaw and teeth).—*Achatina subemarginata* Desh., in Fér., Histoire ii, part 2, p. 187, pl. 134, f. 31, 32 (1851); included by Tryon in Man. Conch. i, p. 35, pl. 6, f. 77.

Fully adult shells are wholly imperforate with 7½ whorls, length 51, diam. 20.5, aperture 24 mm. The outer lip is very thin and acute, and the suture very distinctly and finely crenulate below.

I feel very little doubt that *A. subemarginata* Desh. was based upon a shell of this species. Its habitat was unknown.

2. S. coronatus (Pfeiffer). Pl. 37, figs. 89, 90.

Shell imperforate, oblong-turrite, smooth, thin, diaphanous, waxen-yellowish or whitish. Spire turrite, the apex rather obtuse. Whorls 7, rather flattened, coronated with close small whitish tubercles at the suture; the last whorl slightly more than one-third the total length. Aperture oval; peristome simple, acute, the columellar margin rather straightened, flattened, appressed, reflexed. Length 21, diam. 7.5, aperture 8 x 4 mm. (*Pfr.*).

Brazil (Pfr.).

Bulimus coronatus Pfr., Symbolæ ad Hist. Heliceorum iii, p. 83 (1846); Monographia ii, p. 168; Conchyl. Cab. p. 189, pl. 49, f. 13, 14, and large var., f. 15, 16.—Reeve, C. Icon. v, pl. 64, f. 447.

Pfeiffer's figure, which I have reproduced (fig. 89) is not very good, and an enlarged view is therefore given of a specimen measuring 24.8 mm. long, 7.5 wide, aperture 8

mm. long. The axis is distinctly rimate. The shell is very pale yellowish-white.

3. S. WALLISI (Mousson). Pl. 36, figs. 85, 86.

Shell subperforate, turrite, decollate (defective?), very thin, striatulate, polished, ornamented with very fine, imperfect decussating lines, subdiaphanous, milky whitish. Spire defective; suture simple, slightly impressed. Four whorls remain, slowly increasing, plano-convex, last not descending, obtusely angular, rather flattened above, more convex below. Aperture slightly oblique (18 degrees from the axis), widely ovate, obtusely subquadrate basally. Peristome straight, acute, a little expanded, the margins remote, subparallel, right margin less curved above, more at the base; columellar margin shortly and broadly reflexed and appressed at the insertion; obliquely cut off below. Columella somewhat twisted, passing into the retracted basal margin. Length of defective specimen 26, diam. 12 mm. (*Mouss.*).

Colombia: lower Magdalena valley (Wallis).

Stenogyra wallisi MOUSS., Malak. Blätter xvi, 1869, p. 178. —PFR., Novit. Conch. p. 146, pl. 133, f. 10, 11.—*Bulimus w.*, PFR., Monogr. viii, 131.

Mousson received two examples of this fragile Stenogyroid, both similarly broken, without a septum or plug to close the breach. Besides the delicate whitish and polished but finely lineate surface, it is remarkable for the broadly oval aperture, basally obtuse-angled on each side.

Mousson thinks that the entire shell would be 38 mm. long, with 10 or 12 whorls; and he mentions the possibility that *O. blandi*, which seems to be immature, may be a related form. The generic position of the species is uncertain, and it is placed here merely for want of a better place. Pfeiffer's figures of the type are copied on my plate.

Subgenus PROMOUSSONIUS Pilsbry, 1906.

Similar to *Synapterpes*, but striate and decussate, with the embryonic whorls large and arcuately rib-striate. Type *S. incertus*.

4. S. INCERTUS (Mousson). Pl. 37, figs. 92, 93, 94.

Shell imperforate, long subturrite, rather thin, reticulated with close, rather rough striæ and spiral lines interrupting them; silky; wood-brown, with transverse lines and more spaced descending ones. Spire long conic, the summit large and very obtuse; suture a little impressed, subcrenulate. Whorls 7, plano-convex, the first elegantly rib-striate, the last not ascending, three-eighths the total length, long-ovate, rounded at the base. Aperture subvertical, (25 degrees with the axis), narrowly oval, angular above, wider at the base, effuse, pale within. Peristome unexpanded, acute, the right margin long-arcuate, basal margin receding; columellar margin thin, wholly appressed. Columella long, somewhat twisted, a little thickened below, obliquely subtruncate. Length 40, diam. 16 mm. (*Mouss.*).

Colombia: Bogota (Wallis).

Spiraxis incerta MOUSS., Malak. Bl. xxi, 1873, p. 14.—PFR., Monogr. viii, p. 256; Novit. Conch. p. 147, pl. 133, f. 12, 13.

The surface is closely and rather deeply striate, the striæ being cut by spirals into series of short curves, somewhat festoon-like. The surface is pale yellowish-brown, with numerous brown spiral lines, many of them indistinct, and with narrow vertical streaks of the same color. The summit, as Mousson remarks, is very large, rounded, and arcuately irregularly rib-striate, and there is an apical dimple as in *S. hanleyi*. The columella reminds one of that of *S. hanleyi*; its edge is narrowly reflexed and adnate. A specimen with 6½ whorls, probably not quite adult, measures length 34, diam. 14.5, aperture 17 mm. Figures 92, 93 are copies of the type figures; fig. 94 represents the enlarged apex of a specimen before me.

Subgenus CHRYSERPES Pilsbry, 1906.

Shell glassy, greenish or golden, subtranslucent with weakly crenulate suture and smooth apex, the columella with a spiral fold below; axis perforate. Type *S. amabilis*.

This group may possibly belong to the *Oleacinidæ* near *Dolicholestes.*

5. S. AURATUS (Pfeiffer). Pl. 36, fig. 80.

Shell nearly covered perforate, oblong-turrite, thin, longitudinally finely striate, pellucid; golden, obsoletely marked with darker spiral lines. Spire turrite, obtuse; suture submarginate, minutely crenulate; whorls 7, a trifle convex, the last scarcely two-fifths the total length. Columella rather straightened. Aperture oval-oblong; peristome simple, unexpanded, the columellar margin narrowly reflexed, nearly appressed. Length 30, diam. 10, aperture 13 x 5.5 mm. (*Pfr.*).

Ecuador: Baeza and San José (Martinez); habitat of type in Pfr. coll. unknown.

Bulimus auratus PFR., Proc. Zool. Soc. 1846, p. 32; Monogr. ii, 172.—REEVE, Conch. Icon. v, pl. 51, f. 335.—HIDALGO, Viaje al Pacifico, Moluscos, p. 100.—*Mesembrinus auratus* Pfr., COUSIN, Bull. Soc. Zool. France, xii, 1887, p. 234.

A delicate, glassy species, of the substance and color of a "*Vitrina*" (Reeve). Reeve's figure of the type is given.

Var. *aratus* n. v. Pl. 37, figs. 95, 96.

The whorls, except the very smooth embryonic two, are deeply striate longitudinally, the striæ straight; on the penult. whorl there are three or four in the space of one millimeter. They are strongest near the suture and fade out to a large extent on the base of the last whorl. Length 27, diam. 11, length of aperture 11.8 mm.

6. S. AMABILIS n. sp. Pl. 36, fig. 79.

Shell nearly covered perforate, oblong-turrite, thin, pale green, becoming whitish at the apex, and under a lens showing many very faintly darker spiral lines on the last whorl. Surface very glossy, weakly but rather closely striate, weakly plicate below the suture, which is just perceptibly irregular. Spire straightly turrite, the summit obtuse. Whorls 8½, moderately convex. Aperture a trifle

oblique, acuminate above, narrowed below; outer lip thin and simple, not perceptibly arched forward. Columella subvertical, not reaching the base. There is an oblique fold below, causing it to be obliquely truncate basally; the columellar margin is reflexed. Length 25, diam. 8.7, aperture 9 mm.

Colombia: Marmato (T. Bland).

Closely related to *S. auratus* Pfr., but having more whorls in a smaller shell, a smaller aperture and more distinctly truncate columella. The structure of columella and umbilicus is the same in young shells 7 mm. long as in those of 25 mm.

7. S. BISTORTUS (Pfeiffer).

Shell imperforate, turrite, rather thin, lightly arcuate-striate, glossy, pellucid, olive-corneous; spire elongate, subrectilinear, obtuse; suture lightly impressed, obsoletely crenulate; whorls 11, rather flattened, the last one-fourth the total length, tapering basally, pale. Columella having two twisted, thread-like folds. Aperture oblique, oval-oblong; peristome simple, unexpanded. Length 38, diam. 8, aperture 9 x 4 mm. (*Pfr.*).

Habitat unknown (coll. Cuming).

Spiraxis bistorta PFR., P. Z. S. 1854, p. 293; Monogr. iv, p. 573.

An unfigured species, noticed by no later author. A somewhat similarly two-plicate columella has been found in the African *Subulina columellaris* Martens (see p. 90). Its systematic position is uncertain.

Subgenus ZONIFERELLA Pilsbry, 1906.

Shell glossy, greenish-black with a white peripheral band; columella reflexed, Bulimoid. Oviparous. Type *S. albobalteatus.*

The apical whorls have not been described.

8. S. ALBOBALTEATUS (Dunker). Pl. 37, figs. 97, 98.

Shell small, thin, oblong-ovate, subfusiform, slightly rim-

ate; whorls 6 including the nucleus, moderately convex, brilliantly glossy, subplicate below the suture. Color translucent greenish-black, the last whorl marked with a distinctly defined white band. Columella subreflexed, white. Lip simple, acute. Aperture somewhat narrowed towards the base. Length 13 mm. (*Dkr.*).

Colombia: Pasto, in damp woods (F. C. Lehmann).

Bulimus albo-balteatus Dkr., Jahrb. d. D. Malak. Ges. ix, 1882, p. 378, pl. 11, f. 7, 8.

The white belt of the last whorl is largely concealed on the upper whorls. In the single specimen taken, there were two shining yellowish-white pearl-like eggs, 2 mm. in diameter.

9. S. vesperus (Jousseaume). Pl. 37, fig. 91.

Shell ovate-acuminate, thin, very glossy, obsoletely striatulate, greenish-black with a single white zone. Spire rather long conic, the apex obtuse. Whorls 6, a little convex, the last ample, a little descending in front. Aperture oval; peristome simple, acute; columellar margin whitish, straight. Length 17, diam. 8, aperture 8.5 x 4 mm. (*Jouss.*).

Ecuador: Los Puentos, near Quito (A. Cousin).

Mesembrinus vesperus Jouss., Bull. Soc. Zool. de France xii, 1887, p. 168, pl. 3, f. 2.—Cousin, t. c. p. 234.

This species, of which but one example was taken, evidently stands close to *S. albobalteatus*, differing in little except the larger size.

Genus RHODEA H. & A. Ad.

Rhodea H. & A. Adams, Genera of Recent Mollusca ii, p. 135, for *californica* Pfr. (Feb. 1855).—Crosse, Journ. de Conchyl. 1876, p. 5.—Sykes, Journ. of Malacol. viii, 1901, p. 20 (catalogue).

The shell is imperforate, either dextral or sinistral, pillar-shaped or tapering, with obtuse smooth apex; the earlier whorls are convex, the later flat or concave, last whorl acutely carinate in the middle, deeply concave below the keel. The aperture is oblique, subtriangular, channelled at

the basal and outer angles. Internal axis ascending in an open spiral, at the aperture forming a strong columellar fold above, and continuing to the base; columella concave below the fold, calloused, and sometimes truncate at the base. Viviparous. Soft anatomy unknown. Type *R. californica.*

Distribution, Andean region of Colombia and Ecuador.

A very distinct genus, readily known by its pillar-like form, acute peripheral keel and gyrate axis. Reproduction is viviparous, as first noticed by Bland; the young shells at birth having an oblong imperforate shell of about 2½ whorls, with the columella vertical, somewhat calloused, and obliquely truncate basally (pl. 38, fig. 4). The earlier whorls are convex, but the sixth already shows an angle at the basal periphery. At this stage the columella is subvertical and very weakly, obliquely excised below (pl. 38, fig. 5). Specimens of 8 whorls have a well developed keel, concave base, and a spiral swelling around the columella, which is becoming weakly gyrate (pl. 38, fig. 6). The foregoing account is based upon a series of young *R. californica.*

The individual therefore passes through stages like *Leptinaria* and *Obeliscus* before assuming the special features of *Rhodea.* I consider the genus to stand nearer *Obeliscus* than to any other known group. This was also the opinion of Dohrn.

1. R. CALIFORNICA (Pfeiffer). Pl. 38, figs. 1 to 6, 10.

Shell subulate, thin, obliquely very closely rugose-striate, waxy-whitish; whorls 12 to 13, the upper ones convex, last 3 or 4 flat, the last whorl a little more than one-sixth the total length, acutely carinate at the base, somewhat excavated below the carina; columella arcuate, reaching the base, thickened, subtruncate. Aperture subtetragonal, peristome simple, acute. Length 23, diam. 3.5, aperture 4 x 2.25 mm. (*Pfr.*).

Colombia: Bogota (Akhurst); Marmato (Bland).

Achatina californica PFR., Symbolae ad Hist. Hel. iii, p. 89 (1846); Monogr. ii, p. 266; vi, 236.—REEVE, Conch. Icon. v, pl. 20, f. 115.—BINNEY, Terr. Moll. U. S. iv, p. 26, pl. 79,

f. 19.—Bland, Ann. Lyc. N. Y. viii, p. 166, f. 10.—*Columna* (Rhodea) *californica* H. & A. Ad., Gen. Rec. Moll. ii, p. 135. —Binney, Land and Fresh-Water Shells of N. A. i, p. 190, f. 330.—*Rhodea californica* Dohrn, Jahrb. d. D. Malak. Ges. ii, 1875, p. 308.—*Rhodea pfeifferi* Crosse, Journ. de Conch. xxiv, 1876, p. 14, pl. 1, f. 1.—Pfeiffer, Monogr. viii, p. 255.

This species was originally described from Cumingian examples supposed to be from Monterey, California, but Bland ascertained the true locality to be Colombia. Figures 1, 3-6 represent shells from Marmato. Fresh shells are waxy-whitish and a little transparent when immature, but the old ones become quite opaque and pale yellowish. The striation is dense and fine, very oblique and distinct. The stages of growth have been described under the generic head.

Reeve's figure of the type is copied, pl. 38, f. 10.

Crosse renamed the species on account of the erroneous locality implied by the original name.

2. R. gereti Jousseaume. Pl. 38, fig. 7.

Shell cylindric-turrite, rod-shaped, obliquely, closely and very delicately striate; milk-white, with a thin deciduous yellow cuticle. Spire many-whorled, slowly tapering, the apex obtuse. Whorls 11, a little convex, regularly increasing, separated by a deep linear suture; the early whorls more convex, the rest nearly flat; last whorl angulate-carinate, the anterior part concave and very minutely striate, contracted. Aperture triangular, the outer margin worn, columella thickened, spirally twisted, ascending within, around a very deep and narrow umbilicus. Length 16, diam. 3 mm. (*Jouss.*).

Colombia.

Rhodea gereti Jouss., Bull. Soc. Philomath. Paris, ii, p. 38, pl. 1, f. 16 (1900).

Smallest of the known Rhodeas. The unique example has not completed the outer lip.

3. R. wallisiana Dohrn. Pl. 38, figs. 11, 12, 14, 15.

Shell *sinistral*, cylindric-turrite, thin, closely obliquely rugose-striate, chalky under a pale corneous deciduous cuticle

without much gloss. Whorls 11 to 12, the upper a little convex, the middle ones flat, the last two concave in the middle, separated by an acute projecting carina; the base of the last whorl is excavated around the thread-like, nearly straight, much protracted and basally truncate columella; margin of the peristome arcuate; columella encircled with a wide lamina. Length 34 to 36, diameter in the middle 5 to 6 mm. (*Dohrn*).

Colombia: upper part of the Magdalena valley (Wallis).

Rhodea wallisiana Dohrn, Nachrbl. d. D. Malak. Ges., vii, 1875, p. 57, Jahrb. d. D. Malak. Ges. ii, 1875, p. 307, pl. 10, f. 7, 8.—Crosse, Journ. de Conchyl. xxiv, 1876, p. 21, pl. 1, f. 3.

4. R. crosseana Da Costa. Pl. 38, fig. 9.

Shell cylindric, slowly narrowing towards the apex, subpellucid, corneous. Whorls 13, the upper 3 or 4 smooth, convex, the following 2 or 3 convex, the rest nearly flat, obliquely delicately and closely striate, separated by an oblique suture which is carinate in the last few whorls; last whorl acutely carinate, deeply excavated below the carina. Aperture irregularly quadrate, bicanaliculate; columella spirally twisted, ascending within, forming an umbilicus penetrating nearly to the apex; lip thin, angular in the middle, channelled, concave below. Length 31, diam. 5 mm. (*Da Costa*).

Rhodea crosseana Da C., Proc. Malac. Soc. Lond. iii, p. 305, fig. v (Oct. 1899).

Colombia: Dagua river (W. F. H. Rosenberg). Type in Brit. Mus.

Very much larger than *R. pfeifferi* Crosse, with differently proportioned whorls; the body-whorl more deeply excavated beneath, and the columella differently convoluted and more deeply reflexed, so that the basal channel is conspicuously deeper (*Da C.*).

5. R. gigantea Mousson. Pl. 38, figs. 17, 18, 19.

Shell imperforate, turrite-cylindric, rod-shaped, obliquely closely and evenly plicate-striate, lusterless, covered with a

fugacious corneous-gray cuticle. Spire many-whorled, slowly tapering, the summit rather obtuse, nucleus hyaline and denuded; suture linear. Whorls 14, very slowly increasing, the first glossy, a little convex, parted by an impressed suture, the following whorls flat, separated by a linear or thread-margined suture; last whorl concavely contracted, encircled by a very erect, acute keel, excavated at the base, with a second carina revolving obliquely around the umbilical region. Aperture rather oblique (at 40 degrees with the axis), one-seventh the length, triangular, one angle at the protracted insertion of the outer lip, the second a right angle at the periphery, the third angle at the subvertical, twisted, truncate columella. Peristome rather obtuse, narrowly expanded, a trifle reflexed; the oblique upper right margin is straight, concave forwardly near the carina; the lower or basal margin is straight and horizontal, joining the columella at an angle of 50 degrees; columellar margin narrowly reflexed, partly free below the carina. Length 56, diam, of last whorl 10, at carina 14 mm. (*Mouss.*).

Colombia: Bogota (Wallis); Sonson in the prov. Antioquia, and in the Cauca Valley.

Rhodea gigantea Mouss., Malak. Bl. xxi, 1873, p. 15.—Pfr., Novit. Conch. p. 119, pl. 127, f. 10, 11; Monogr. viii, p. 253.—Kobelt, Jahrb. d. D. Malak. Ges. ii, 1875, p. 222, pl. 6, f. 5.—Crosse, Journ. de Conch. xxiv, 1876, p. 18, pl. 1, f. 2.—Da Costa, Proc. Malac. Soc. Lond. iii, p. 305, figs. i, ii.

6. R. cousini Jousseaume. Pl. 38, fig. 16.

Shell narrowly and very deeply umbilicate, worm-shaped, collared anteriorly with an acute spiral keel, rather thin, corneous-buff, obliquely wavy striate, the apex smooth, obtusely conoid. Whorls 14, the first a little convex, the following ones flat, the rest excavated, parted by a straight carina at the suture, this carina median on the last whorl, which is excavated below it. Aperture suboblique, triangular, margin simple, columella thickened, arcuate, reaching to the base, forming a channel with the basal margin.

Length 40, diam. 5, or across the keel 7 mm. Aperture 5 mm. (*Jouss.*).

Ecuador: Guallabamba and between Pacto and Pachijal (Cousin).

Rhodea cousini Jouss., Bulletin Société Philomathique de Paris, n. sér. ii, p. 36, pl. 1, f. 15 (1900).

Smaller than *R. gigantea,* but larger and more slender than *R. wallisiana.* It tapers above less than *R. gigantea.*

The Bulletin containing M. Jousseaume's paper was received at the Academy on August 13, 1900.

7. R. AEQUATORIA Da Costa. Pl. 38, fig. 13.

Shell elongate, cylindric, dextral or sinistral, dirty whitish, more or less covered with a buff cuticle. Spire cylindric, gradually tapering above, rather obtuse at the summit. Whorls 13, the upper 5 a little convex, the following 6 flat, the last two concave, carinate at the periphery, radially striate below the angle, flat. Aperture (broken and left blank in the figure). Columella arcuate, spirally revolving, forming a hollow umbilicus. Length 23, diam. 4.5 mm. (*Da C.*).

Ecuador: Paramba.

Rhodea æquatoria Da C., Proc. Malac. Soc. Lond. iii, p. 304, figs. iii and iv (Oct. 1899).—*Rhodea æquatorica* Da C., Sykes, Journ. of Malacol. viii, 1901, p. 20.

"From the imperfect condition of the apertures of these shells it is impossible to ascertain the exact form of the mouth, but from their general aspect it is probable this is similar to that of *Rhodea wallisiana Dohrn,* which however is a somewhat larger species. Two specimens only were found by Mr. Rosenberg during his recent travels in Ecuador, one being dextral, the other sinistral" (*Da C.*).

Mr. Sykes, in his catalogue of the genus, has altered the spelling of the name *æquatoria,* and wrongly quotes the page.

8. R. EQUATORENSIS Jousseaume. Pl. 38, fig. 8.

Shell cylindric, openly and very deeply umbilicate, thin, waxy-white, obliquely very delicately and quite regularly striate, whorls 10, the first a little convex, first two whorls

forming an obtuse apex, to the fifth or sixth tumid and greenish, following three flat, the last whorl carinate, somewhat excavated beneath; suture impressed, irregularly crenulate. Aperture subtetragonal, somewhat channelled anteriorly. Columella thickened, arcuate, screw-shaped inside. Peristome simple, acute. Length 15, diam. 3 mm. (*Jouss.*).

Ecuador: Los Puentos (Cousin).

Rhodea equatorensis Jouss., Bull. Soc. Philom. Paris ii, p. 37, pl. 1, f. 17 (1900).

This shell resembles *R. californica*, but it is smaller and of less regular growth, whorls v, vi and vii being larger than the succeeding and greenish while the rest are dull. The keel of the last whorl projects less and the base is less excavated.

Genus OBELISCUS Beck, 1837.

Obeliscus Beck, Index Moll., p. 61, for (1) *calcareus*, (2) *sceptrum*, (3) *obtusatus*, (4) *decollatus*, (5) *obeliscus*, (6) *gnomon*, (7) *sylvaticus*, (8) *subuliformis*, (9) *septenarius*, (10) *stylus*, (11) *bacterionides*, (12) *micra*, (13) *annaensis*, (14) *gracillimus*, (15) *clavulus*, (16) *goodalli*, (17) *oryza*, (18) *mimosarum*, (19) *brephos*. Not *Obeliscus* Humphrey, Museum Calonnianum, p. 24 (1797). Cf. Herrmannsen, Indicis, ii, p. 131.

Stenogyra Shuttl. (in part), Beiträge zur näheren Kenntniss der Land- und Süsswasser-Mollusken der Insel Portorico, in Mittheilungen der naturforschenden Gesellschaft in Bern, aus den Jahre 1854, p. 45 (March, 1854); and in Annals of the Lyc. of Nat. Hist., N. Y., vi, p. 70, foot-note (March, 1854); and of many subsequent authors.—*Bulimus* of the older writers.

Shell imperforate or nearly so, subcylindric or tapering, usually rather large, solid and opaque; whorls 9 to 18, somewhat convex, not carinate. Embryonic whorls smooth, the summit obtuse. Aperture ovate, the outer lip simple and short, columella concave or vertical, continuous or indistinctly truncate at base. Viviparous, the embryonic shell globose or oblong, of about 3 whorls, and very small compared with the adult. Type *O. obeliscus*.

Distribution, tropical South America and the Greater Antilles.

This extensive genus comprises all of the large American *Achatinidæ* except *Neobeliscus calcareus*, but also some species no larger than *Opeas* or *Subulina*. It has not the free, overhanging columellar reflection of *Opeas*, nor the strongly truncate columella of *Subulina*. A few of the smallest species are clear corneous, but most of them are opaque and more solid than *Opeas*. The reproduction is known to be viviparous in some species of all the subgenera except *Lyobasis*, in which nothing is known of the reproduction. Embryos may often be shaken out of dry shells of the larger species after soaking them to macerate the dry contents.

Obeliscus was proposed for some nineteen species enumerated above. Six of these, nos. 2, 6, 10, 13, 14, 19, are nude names, introduced without description by Beck; no. 4 is type of the prior genus *Rumina;* nos. 12, 15, 16, 18 have been referred to the later genus *Opeas;* and no. 3 belongs to the genus *Clavator*. The remaining forms (*O. calcareus, obeliscus, sylvaticus, subuliformis, septenarius, bacterionides*), are referable to two genera, one containing the first species, *O. calcareus*, the other including the rest. Herrmannsen (Sept. 8, 1847) mentioned *O. calcareus* as typical, and Gray (P. Z. S., Nov., 1847) independently selected *obtusatus;* but the principle that a tautonomic genus takes as type the species upon which the generic name was based is one of such obvious propriety, and has won such wide acceptance among naturalists in other departments of zoölogy, that I do not hesitate to consider *O. obeliscus* Spix as type of the genus *Obeliscus*.

The name *Obeliscus* was used earlier by Humphrey for the group of *Trochus dolabratus* Linné, but in an anonymous catalogue, the *Museum Calonnianum*, not considered acceptable as a source of nomenclature.

The genus *Stenogyra* was proposed by Shuttleworth to include numerous turrited, unicolored, mostly pale or translucent shelled forms, which had been placed in *Bulimus* and *Achatina* by former authors. The group was so obviously natural that it came at once into use, and it is only of late

that the necessity has been felt of recognizing several genera in place of the one. Stenogyra in its original limits corresponds now to a subfamily rather than a genus. As sections of *Stenogyra*, Shuttleworth ranked the following: *Opeas* Albers (1850), with the species *subula, octonoides, margaritacea, alabastrina, gompharium, goodalli.*

Pseudobalea Shuttlw. (1854), species *dominicensis* Pfr.

Obeliscus Beck (1837), species *swiftiana, terebraster.*

Subulina Beck (1837), species *octona, acicularis.*

No type was selected for *Stenogyra;* and if the ordinary process of elimination be applied to the group, the name *Stenogyra* must replace the so-called *Obeliscus* of Shuttleworth's list, which are not typical *Obeliscus* as now restricted. This view I took in 1899 when I selected *S. terebraster* as type of *Stenogyra.* By another method of elimination, *Stenogyra* would take the place of *Pseudobalea* Shuttl. Mr. E. A. Smith suggests that *Stenogyra* be dropped entirely, on the ground that it was proposed without a type, to cover a number of groups already instituted. In a case like this where the author's evident intention was to form a new genus by the union of several prior groups, and yet by the inclusion of new species renders it not exactly equivalent to them singly or collectively, no two subsequent students can be expected to arrive at the same conclusion in its restriction. It becomes a matter of convenience or personal predilection. I can see no serious objection to the use of *Stenogyra* as a section of *Obeliscus* for the *O. terebraster* group, which differs sufficiently from typical *Obeliscus* to require a special designation.

Obeliscus is closely related to *Rhodea* and *Neobeliscus*, both evidently branches from the *Obeliscus* stem. *Rhodea* diverges from the parent stock in its later stages of growth, *Neobeliscus* in its embryonic stage. The forms remaining in *Obeliscus* constitute several subordinate groups, some of which may hereafter be raised to genera. The rank of the several groups in this classification depends largely upon the prominence of their special modifications, and does not necessarily involve the comparative antiquity of the group. Thus *Rho-*

dca may be the result of a later radiation than that which separated *Obeliscus* and *Protobeliscus*.

Key to Subgenera of Obeliscus.

NOTE.—Keys to the species may be found under the subgeneric heads.

I. Embryonic shell with a convexly-conic spire and subacute apex, the columella straight, not truncate. Adult shell thin, smoothish, sinistral, very long, composed of 12 to 15 whorls. Antilles.

Subgenus PSEUDOBALEA, species 29, 30.

II. Embryonic shell with globose or hemispherical spire, flattened at the summit; shell dextral.

a. Columella of the embryonic shell entire, not truncate or excised below (pl. 37, f. 100); adult shell dextral, smoothish or finely striate, usually large. South America.

Subgenus OBELISCUS s. str., species 1 to 8.

aa. Columella of the embryonic shell more or less truncate or excised at base (pl. 37, figs. 102, 103); adult shell smoothish, not rib-striate.

b. Columella of the adult with reflexed edge, not calloused. Andean.

Subgenus PROTOBELISCUS, species 9 to 17.

bb. Columella of the adult calloused below. Antilles. Subgenus STENOGYRA, species 18 to 28.

aaa. Columella of the embryonic shell unknown; adult shell small, *ribbed or rib-striate*, two embryonic whorls of the globose summit smooth. Western Cuba. Subgenus LYOBASIS, species 31 to 36.

The limits of the groups *Obeliscus s. str.*, *Stenogyra* and *Protobeliscus* have not been marked out in detail, because the essential differences of the first two are in the embryonic shells, which are known in but few species. In general, *Obeliscus* is Brazilian, *Protobeliscus* Andean, and *Stenogyra* is Antillean.

Numerous species which have been described or mentioned

under the generic term *Obeliscus* belong to the Lamarckian genus *Pyramidella*. There are also some very briefly or insufficiently described bulimi which may have been based upon species of *Obeliscus*, the descriptions of which follow.

Achatina sellovii King. Shell cylindric, transversely striate, subdiaphanous; length five-sixteenths, diam. two-sixteenths inch. (King, Zoöl. Journal, v, p. 343.) Brazil. May be an *Opeas*.

Achatina sordida King. Shell subdiaphanous, subconic, basal whorl ventricose. Length six-eighths, diam. three-eighths of an inch. Rio Janeiro. (King, Zoöl. Journ., v, p. 343.) May be an *Opeas*.

Achatina strigata King. "T. diaphana, subalbida, creberrime transversim substriata, strigis longitudinalibus castaneis raris; anfractus basalis subangulatus.—Long. eleven-sixteenths, lat. six-sixteenths inch." (*King*, Zoöl. Journ., v, p. 343). Brazil.

Bulimus septenarius Brug., Encycl. Méth., i, p. 324, no. 46, said to be from Lima, Peru, might be an *Obeliscus* or *Stenogyra*, but is more likely a *Drymæus* of the group of *D. morbidus, D. chenui*, etc. (Manual, vol. xi, p. 283); and probably could be identified in a good Lima collection, if really from that place. It is described as white, smooth, transparent and turriculate, composed of 7 very slightly convex whorls; not over one inch long and four lines in diameter at the base. The aperture is oval, twice as long as wide, with a thin, acute outer lip, the inner lip a little recurved in the region of the axis, over the perforation. The columella is straight and rounded.

Species of Brazil and Bolivia (Subgenus *Obeliscus s. str.*).

Most of the Brazilian Obelisks probably belong to the typical subgenus, but the embryonic shell has been examined in *O. obeliscus* only.

I. Shell closely striate, opaque, the diameter contained 4¼ to 5 times in the length; whorls 13 to 18.

a. Adult shell 100 mm. long or more, often trun-

cate at the tip, finely and densely striate.
O. obeliscus, no. 1.

aa. Shell 72 x 14 or 15 mm., with 15 to 18 whorls.
O. carphodes, no. 2.

aaa. Shell 84 x 17 mm. with 13 *flattened* whorls.
O. planospirus, no. 3.

II. Shell wrinkled below the suture, elsewhere smoother, the diam. contained 3½ to 4 times in length; whorls 10-12.

a. Summit large, the diam. at second whorl 2.8 mm.; 28 x 8 mm., with 8 whorls.
O. pattalus, no. 6.

aa. Summit smaller, 2 mm. diam.; whorls 11 to 12.

b. 34 x 9 mm., aperture contained four times in length of shell. *O. agassizi*, no. 5.

bb. 31 x 7 mm.; spire more slender, aperture smaller, 4½ times in length.
O. sylvaticus, no. 4.

III. Shell smooth, thin and pale, 14 x 4 mm. with 9 whorls.
O. bacterionides, no. 7.

IV. Shell smooth, thin and whitish, *very slender*, 22 x 3 mm., with 14 flattened whorls. *O. subuliformis*, no. 8.

1. O. OBELISCUS (Moricand). Pl. 34, figs. 44 to 48, 51.

"Shell elongate, terebriform, whorls 15, very finely striate, ashy-buff, lip simple. Length 85, diam. 17 mm." (*Moricand*).

Brazil: Caravelhas (Moric.); Bahia (Paz), Taguara, Prov. Rio Grande do Sul (v. Ihering).

Helix (*Cochlicella*) *obeliscus* MORIC., Mém. de la Societe de Phys. et d'Hist. Nat. de Genève, vi, 1833, p. 540, pl. 1, f. 4; vii, p. 424 (eggs and young).—*Bulimus o.*, REEVE, Conch. Icon., v, pl. 52, f. 343.—DESH. in Fér., Hist., ii, p. 113, pl. 142 A, f. 3, 4.—PFR., Monogr., iii, p. 395; Conchyl. Cab., p. 107, pl. 34, f. 1.—HIDALGO, J. de Conch., 1870, p. 55.—*Sten.* (*Obeliscus*) *obeliscus* Mor., Clessin, Malak. Bl. n. F., x, p. 169.

Moricand described an immature specimen of the narrow

phase of this species. His original figure, copied in my fig. 44, shows the pale color and angular periphery of youth. In his second publication he mentions receiving others, up to 11 cm. long. In fig. 45 a young shell 71 x 15 mm., with 14½ whorls is drawn. The embryonic second whorl is 3.2 mm. diam. The fully adult shell of this form is shown in fig. 47, 105 x 25 mm., with 11½ whorls remaining. The shell is thin, light, and pale greenish or grayish-buff in the young, but the adult is solid, heavy, and of a rich chestnut-tinged olive-yellow color on the later whorls, the earlier always whitish. The surface is finely, sharply and densely striate, the striæ interrupted by a few spiral lines in the immature stage, but on the later whorls of the adult form this sculpture is more or less obsolete. The apex is truncate in full-grown shells. The columella is straight above, concave below, with no callous, but its edge is reflexed and closely appressed.

There is a wider phase or form of this species in which the spire tapers more rapidly and the whorls are shorter, a greater number therefore being present in specimens of the same length; the other characters remaining practically identical. An adult 104 mm. long is 25½ mm. wide, retaining 13 whorls. The immature and adult stages of this wider phase are figured, pl. 34, figs. 46, 51.

Specimens kept in captivity by Moricand brought forth young ones. They are born in a capsule of clear, limpid fluid confined by an extremely thin membrane, pl. 34, fig. 48.

This species is type of the genus *Obeliscus*. The embryonic shell, pl. 37, fig. 100, taken from the shell drawn in pl. 34, fig. 47, is oblong, perforate, and composed of 3½ whorls.

2. O. CARPHODES (Pfeiffer). Pl. 34, fig. 53.

Shell imperforate, long-turrite, the apex obtuse, regularly and closely striate, ashy-buff. Whorls 16 to 18, slowly increasing, a little convex, the last nearly smooth, about two-elevenths the length. Columella straight, simple, the aperture oval, peristome unexpanded, acute, the columellar margin narrowly reflexed, appressed. Length 72, diam. 14, aperture 13 x 7 mm. (*Pfr.*).

Brazil.

Bulimus obeliscus Moric., Pfr., Monographia, ii, p. 152, and of Deshayes in Fér., Hist., pl. 142 A, f. 5, 6; not of Moricand.—*Bulimus carphodes* Pfr., Conchyl. Cab., p. 108, pl. 34, f. 2; Monogr., iii, p. 396 (1853).

This is a more slender and less solid species than the closely related *O. obeliscus*, with more whorls in shells of equal length. Pfeiffer's figure, copied on my plate, well represents it. A specimen before me measures, length 72, diam. 15, diam. at second whorl 3, length of aperture 14.5 mm., whorls 15. Deshayes has figured a larger shell, about 79 x 17 mm.

3. O. planospirus (Pfeiffer). Pl. 34, fig. 52.

Shell imperforate, turrite, solid, closely wrinkle striate, obsoletely decussate with impressed lines, alabaster white under a deciduous tawny cuticle. Spire elongate, at the apex passing into an obtuse cone; suture impressed. Whorls 13, nearly flat, the last about one-fifth the length, obsoletely angular below the middle. Columella rather narrow, calloused. Aperture oblique, truncate-oblong; peristome simple, unexpanded. Length 84, diam. 17, aperture 16 x 8 mm. (*Pfr.*).

Habitat of type from Cuming coll. unknown. Head waters of the Mucury river in eastern Minas Geraes, Brazil (Lieut. Will).

Bulimus planospirus Pfr., Proc. Zoöl. Soc., 1852, p. 60; Monogr., iii, p. 396; Conchyl. Cab., p. 108, pl. 34, f. 3.—*Stenogyra planospira* Pfr., Dohrn, Jahrb. D. Malak. Ges., x, 1883, p. 354.

"Differs from *B. obeliscus* in sculpture, the wider and flatter whorls and the apex" (*Pfr.*). Dohrn notes that it differs from the very closely related *O. obeliscus* by the flatter, more rapidly increasing whorls and the consequently greater length of the aperture, while tangible differences in the sculpture are not present. I have not seen the species.

4. O. sylvaticus (Spix et Wagner). Pl. 34, figs. 54, 55.

"Shell long-conic, subturrite, smooth, glossy, pellucid, sub-

imperforate. Whorls 11 or 12, convex, gradually increasing, parted by a deep suture. Spire very long, the apex obtuse. Aperture ovate, thin, the margin simple and acute. Color of the shell white. Length 1 inch 3 lines, width 3½ lines (*Wagn.*).

Brazil: Province Piauhy in woods (Spix).

Columna sylvatica Spix on plate.—*Bulimus sylvaticus* Wagner, Testacea fluviatilia quæ in itinere per Brasiliam, etc., p. 11, pl. 10, f. 4 (1827).—*Bulimus sylvaticus* Spix, Reeve, Conch. Icon., v, *Achatina*, pl. 18, f. 95.—Hidalgo, Journ. de Conch., 1875, p. 130.

The original description and figure (copied in fig. 54) agree with specimens collected by J. G. Anthony, due allowance being made for bad drawing in Spix's figure, which has the sutures too oblique. I figure one of Anthony's shells, pl. 34, fig. 55. It is thin, imperforate, pale greenish-yellow, very glossy, with irregular wrinkles immediately below and slightly crenulating the sutures, but elsewhere obsolete. The spire tapers regularly to a very obtuse apex. Whorls 11½, evenly and moderately convex. The columella is slightly concave, nearly straight, thin, not at all calloused, but reflected and adnate above. Length 31.7, diam. 7.3, aperture 6.7 mm.; diam. at second whorl 2 mm.

According to Hidalgo, this species was collected by Paz at Bahia and Rio Janeiro.

Var. *columella* (Philippi). Pl. 34, figs. 49, 50.

Shell cylindric-turrite, the apex obtuse; *very smooth*, very glossy, dirty white; whorls 10, a little convex, the last subangular at base. Aperture oblique, semiovate, the peristome simple, unexpanded. Length 25, diam. 6½, aperture 5½ mm. (*Phil.*).

Brazil.

Bulimus columella Phil., Abbild. Beschreib. neuer oder wenig gekannter Conchylien, i, p. 158, *Bulimus*, pl. 2, f. 7 (Oct., 1844).—Pfr., Monogr., ii, p. 155.

Pfeiffer has reduced this to a synonym of *O. sylvaticus* in the later volumes of the Monographia (vi, p. 91). A speci-

men before me which seems referable to *columella* has a smaller apex than *sylvaticus*, agreeing with Philippi's figures. It is likely that the form may stand as a variety.

A somewhat similar shell has been figured by Deshayes in Férussac's Histoire, ii, p. 166, pl. 142 A, f. 7, 8, under the name *B. terebraster*.

5. O. AGASSIZI Pilsbry, n. sp. Pl. 36, fig. 76.

Shell minutely perforate, thin, pale yellowish-corneous, the later whorls plicatulate immediately under the suture but elsewhere nearly smooth; turrite-conic, the spire a trifle contracted above. Apex subglobose. Whorls 11, convex, the last two flattened, very regularly increasing, the last weakly subangular at the periphery. Aperture somewhat oblique, ovate; outer lip thin; columella nearly straight, very slightly concave, not twisted or subspiral above, its edge narrowly reflexed, the reflection long, basal margin retracted. Length 34, diam. 9, length of aperture 8.5 mm.; diam. at second whorl 2 mm.

Brazil (J. G. Anthony, Agassiz exped.).

This is a form of the *Obeliscus* group, differing from *O. obeliscus* and *O. carphodes* by its conspicuously smaller embryonic whorls, while *O. sylvaticus* is of much more slender form, with smaller aperture. The specimens were on a tray with *O. sylvaticus*. It probably attains a somewhat larger size.

6. O. PATTALUS Pilsbry, n. sp. Pl. 36, fig. 70.

Shell imperforate, thin, dirty yellowish-olive, slightly shining, weakly striate; turrite, the side-slopes straight, the summit rounded, *very obtuse*. Whorls 8, but slightly convex, the later ones nearly flat, last whorl very indistinctly subangular in front, tapering below. Aperture somewhat oblique, ovate; outer lip thin, hardly arched forward. Columella slightly concave, dilated above, with the edge thin, reflexed and adnate, brownish. Length 27.2, diam. 8, aperture 8.9 mm.; diam. at second whorl 2.8 mm.

Brazil (Moricand).

This small species is remarkable for its very large, obtuse summit and the straight spire, not in the least attenuate above, being convex rather than contracted there. It was sent by Moricand to R. Swift as *B. sylvaticus* Spix, and is probably from the province of Bahia. It is a stouter species, with a far larger summit, than *B. clava* Rve., the habitat of which is unknown. I have not been able to compare it with typical *O. haplostylus* Pfr., which seems to be related. Some specimens are a little more slender than the type, 28 x 7.8 mm., aperture 8.8 mm.

7. O. BACTERIONIDES (Orbigny). Pl. 36, figs. 71, 72.

Shell very long, turrite, subcylindric, thin, transparent, smooth, whitish or amber-colored. Spire obtuse. Whorls 9, flattened. Aperture nearly quadrangular, narrowed above and below; columella straight, acute, truncate; lip thin. Length 17 [or 14?], diam. 4 mm. Animal very long, yellowish (*Orb.*).

Bolivia: arid hills of the Rio Grande, provinces of Laguna and Valle Grande, at the last foot-hills of the Andes, chiefly at a place called Pampa Ruis, under stones (Orb.); San Pedro Paraguay (Borelli).

Helix bacterionides ORB., Mag. de Zoöl., 1835, p. 9.—*Bulimus b.*, ORB., Voy. dans l'Amér. Mérid., p. 260, pl. 29, f. 1-3. —PFR., Monogr., ii, p. 156; iii, p. 393; Conchyl. Cab., p. 117, pl. 35, f. 15-17.—DESH. in Fér., Hist., ii, p. 116, pl. 142 a, f. 12-14.—*Subulina b.*, ANCEY, Boll. Mus. Zoöl. ed Anat. Comp. R. Univ. Torino, xii, no. 309, p. 6 (1897).

"This species is very close to *B. octonus*, but differs trenchantly by the flattening of the whorls, rendering the mouth angular instead of rounded; it is also less conic and smoother, otherwise having the same appearance and characters" (*Orb.*).

No columellar truncation can be traced in d'Orbigny's figure, which I have copied. Pfeiffer, who probably had authentic specimens, states that it is imperforate, and the columella is somewhat callously twisted above. He gives the dimensions as 14 x 4 mm. The "17" of Orbigny's descrip-

tion is probably an error for 14, as that is about the length of his size figure.

8. O. SUBULIFORMIS (Moricand). Pl. 36, fig. 75.

"Shell turrite, elongate, very narrow, smooth, glossy, white. Whorls flat and numerous, the apex obtuse. Aperture ovate, the lip acute.

"This species, which appears to me new, is remarkable for the great number of whorls, 14 in the individuals in my possession, which do not appear to be adult, and also for its greatly lengthened shape. It is thin, fragile, of a dirty white color, glossy, almost without striæ. The whorls of the spire are nearly flat, the sutures not deep. Length 22, diam. 3 mm." (*Moric.*).

Brazil: wood of St. Gonsalves, near Bahia (Moricand).

Helix subuliformis MORIC., Mém. Soc. Phys. et d'Hist. Nat. de Genève, vii, p. 427, pl. 2, f. 3.—*Bulimus s.*, POT. et MICH., Galerie des Moll., i, p. 156, pl. 15, f. 15, 16.—REEVE, Conch. Icon., pl. 68, f. 486.—PFR., Monogr., ii, p. 155.

Very distinct by its extremely narrow figure.

Species of Ecuador and Peru (Subgenus PROTOBELISCUS Pils.).

So far as I know, the following species belong to the section *Protobeliscus*, which differs from *Obeliscus* by the abruptly truncate columella of the embryonic shell, pl. 37, fig. 102, *O. cuneus*. It is more globose than the embryo of *Stenogyra* (fig. 103) or *Pseudobalea*, and differs from the corresponding stage in *Obeliscus* (fig. 100) and *Neobeliscus* (fig. 99) by its short form as well as in the columella. *Neobeliscus* (fig. 99 natural size) has an enormously larger embryo than any of the other groups. *Protobeliscus* is further distinguished from typical *Obeliscus* by the rather thin, smoothish shell, not so distinctly striate, and the longer whorls. The type is *O. cuneus* Pfr.

The following key will probably be found of little practical use on account of the variability of the species in size.

I. Large forms, over 50 mm. long.
  a. Summit very obtuse; aperture subvertical. *O. cuneus*, no. 9.
  aa. Summit attenuate; aperture oblique. *O. major*, no. 10.
II. Smaller forms, 25 to 50 mm. long.
  a. Spire very thick above; length 5 times the diam. *O. pairensis*, no. 11.
  aa. Spire regularly tapering: length 3½ to 4 times diam.
    b. 39 x 10 mm., whorls 9. *O. haplostylus*, no. 12.
    bb. 27 x 8 mm., whorls 9. *O. jousseaumei*, no. 13.
    bbb. 36 x 9 mm., whorls 10. *O. cuneus minor*, no. 9.
III. Small, 8 x 2 mm., with 7 whorls. *O. pusillus*, no. 14.

9. O. CUNEUS (Pfeiffer). Pl. 35, figs. 56, 57, 58, 59.

Shell imperforate, turrite-club-shaped, solid, smooth, arcuately irregularly substriate, tawny. Spire turrite, the apex rather acute; suture minutely crenulate, bordered with an impressed line. Whorls 10, flat, the last two-sevenths the total length, rounded basally. Columella slightly arcuate, narrowly calloused, flat. Aperture subrhombic-oval; peristome simple, unexpanded, the right margin very slightly arcuate, basal margin forming an obtuse angle with the columella. Length 63, diam. 16, aperture 18.5 x 10 mm. (*Pfr.*).

Ecuador: on the Mira river (Bourcier, type loc.). Nanegal (Martinez); Val de Pilaton, about 3,000 meters above sea level (Boetzkes); Los Puentes near Gualea at about 1,500 meters, on low herbage in very damp places (Cousin).

Bulimus cuneus PFR., Proc. Zoöl. Soc., 1852, p. 154; Monogr., iii, p. 390; Conchyl. Cab., p. 96, pl. 32, f. 11, 12.—HIDALGO, Journ. de Conch., 1870, p. 56; Viaje al Pacifico, Moll., p. 97.—*Obeliscus cuneus* Pfr., MILLER, Malak. Bl., xxv, 1878, p. 195; n. F., i, 1879, pl. 6, f. 3 b, var. *minor*.—COUSIN, Bull. Soc. Zoöl. de France, xii, 1887, p. 237.—*Bulimus fairmaireanus* PETIT de la SAUSSAYE, Journ. de Conch., 1853, p. 156, pl. 5, f. 8.

The surface is glossy, with only faint striation, and cov-

ered with a chestnut-tinged yellow or olive-yellow cuticle, paler above and worn from the upper whorls. A narrow sutural margin is conspicuous, but occasionally obsolete. The spire remains thick until quite near the apex. The outer lip is decidedly arcuate in side view (fig. 58), but the aperture is vertical, not oblique as in *O. major*. Well-grown specimens measure 67 x 16.8 mm., aperture 20 mm., and have 11 whorls.

The columella in uterine young shells is distinctly truncate obliquely, and this sinuation may be seen near the apex in sections of adult shells. Elsewhere the axis is straight and slender. A dried specimen opened by me contained 8 embryonic shells, the largest 4.7 mm. long, 3.6 wide, with 3 whorls. Like the adults, they are imperforate (pl. 37, fig. 102). Miller mentions finding 12 embryos in a specimen he opened. The synonymous *B. fairmairianus* is figured, fig. 59. Figures 56, 57 are Pfeiffer's type of *cuneus*.

Var. *minor* Miller. Pl. 35, fig. 63. Whorls 10, length 36, diam. 9, aperture 10 x 5 mm.; only a trace of the subsutural line; striation more distinct. With *cuneus* in the Val de Pilaton. The name is preoccupied by Pfeiffer for a form of *O. riparius*, and Miller's variety is probably referable to *O. major*.

Var. RIPARIUS (Pfeiffer). Pl. 35, figs. 61, 62.

Shell imperforate, turrite, solid, striate, opaque, straw-colored. Spire long, the apex rather obtuse; suture linear, very closely crenulate, not margined. Whorls 11, slowly increasing, flat, the last less than one-fourth the total length, rounded basally. Columella slightly twisted, then vertically descending. Aperture small, acuminate-oval; peristome simple, unexpanded, the right margin lightly arcuate, columellar margin a little reflexed. Length 53, diam. 11, aperture 12.5 x 6.5 mm. (*Pfr.*).

Ecuador: banks of the Mira river (Bourcier); Baeza, San José, among plants in very damp places (Martinez).

Bulimus riparius PFR., Proc. Zoöl. Soc., 1852, p. 155; Conchyl. Cab., p. 97, pl. 32, f. 13, 14; Monogr., iii, p. 391;

vi, p. 91, var. *minor*.—Hidalgo, Journ. de Conch., 1870, p. 55; Viaje al Pacifico, p. 98.

This form, of which I reproduce the original description and figures, is probably not separable from *O. cuneus*. Hidalgo and Miller have remarked on the great similarity, the former adding that *riparius* is paler, with a proportionally smaller aperture, obtuse apex, no subsutural line, and a less convex last whorl. Pfeiffer, in Monographia VI, mentions a minor form, 29-30 mm. long, 8.5 wide, aperture 8 mm. long.

10. O. major (Miller). Pl. 35, fig. 64.

Whorls 11½; length 86, diam. 21, aperture 22 x 12 mm.

Ecuador: Val de Pilaton, about 3,000 meters above sea level (Boetzkes).

Obeliscus cuneus var. *major* Mill., Malak. Bl., n. F., i, 1879, pl. 6, f. 3 b.

Miller's figure seems to represent a form which differs from *O. cuneus* by the conspicuous attenuation or contraction of the upper portion of the spire, the oblique aperture and the concave, subsinuous columella. There is no subsutural margining impressed line. I have figured a series from the collection of the Academy, pl. 35, figs. 60, 65, 66, 67.

The shell is imperforate, rather thin, but moderately strong, covered with a greenish-yellow, smooth and rather glossy cuticle. The spire tapers slowly, but at the upper fourth more rapidly, so that *near the summit it is distinctly attenuate*. Whorls 11½, the earlier ones convex, rather narrow and slowly widening; the last four whorls are very wide and *almost flat*, the last whorl being a little more convex than the preceding. Suture linear, quite oblique, pale-edged below, slightly arched forward. Columella narrow, concave below, *ascending in a long, weak spiral*, the edge reflexed and appressed above; parietal callous thin, transparent. Length 71.8, diam. 16, length of aperture 19.5 mm.

Ecuador: Quito (purchased by R. Swift from John Calvert, 167 Strand, London).

The contrast between this form and *O. cuneus* in the shape

of the columella and the obliquity of the lip is well seen by comparing fig. 58 (*cuneus*) with fig. 60 (*major*).

A smaller specimen is drawn in fig. 66. Length 57, diam. 13.4, aperture 15 mm., whorls 11⅓. It is typical in other respects.

Another lot of two specimens, fig. 67, differs in having the contraction of the apical fourth more pronounced, and the last whorl more inflated, causing a change in the shape of the aperture, which is wider below. They are otherwise like the types.

Length 64.3, diam. 17, aperture 18.8 mm., whorls 11⅓.

Length 60.2, diam. 17, aperture 18.7 mm., whorls 11.

11. O. PAIRENSIS (Higgins). Pl. 36, fig. 82.

Shell imperforate, turrite, rather thin, smooth, obliquely striate, yellowish-tawny. Spire turrite, the apex obtuse, suture crenulate-margined. Whorls 10, flat, the last about one-fourth the total length, tapering basally. Columella callous, slightly arcuate. Aperture oblique, acuminate-oval; peristome simple, unexpanded, the right margin somewhat sinuous. Length 47, diam. 9 mm. (*Higg.*).

Ecuador: Paira (Mr. Clarence Buckley).

Rumina (*Stenogyra*) *pairensis* HIGGINS, Proc. Zoöl. Soc. Lond., 1872, p. 685, pl. 56, f. 1.—*Bulimus p.*, PFR., Monogr., viii, 128.

Remarkable for its thick spire and narrow, club-like shape. It evidently stands close to *O. cuneus*.

12. O. HAPLOSTYLUS (Pfeiffer). Pl. 36, figs. 68, 69.

Shell imperforate, turrite, rather thin, subarcuately costulate-striate, diaphanous, yellowish-green. Spire long, obtuse. Whorls 9, rather flat, the last nearly smooth, two-sevenths the total length. Columella very simple, arched inward. Aperture oblong-oval, peristome simple, acute. Length 39, diam. 10, aperture 11 x 5.5 mm. (*Pfr.*).

Ecuador: El Catamaija near Loxa (Hartweg, type loc.); Cuenca (Martinez); Los Puentes (Cousin). Peru: Tambillo (Stolzmann).

Bulimus haplostylus Pfr., Symbolæ ad Hist. Hel., iii, p. 84 (1846); Monogr., ii, p. 152; vi, 94.—Hidalgo, Viaje al Pacifico, p. 132; J. de Conch., 1875, p. 130.—Lubomirski, Proc. Zoöl. Soc., 1879, p. 724.—*Obeliscus h.*, Cousin, Bull. Soc. Zoöl. France, xii, p. 238, 1887.—*Bulimus terebraster* Reeve, Conch. Icon., v, pl. 52, f. 341, not of Lamarck.

Pfeiffer's description and Reeve's figure (fig. 69) of the type are given, with the figure of a smaller specimen (fig. 68). The shell has a very large apex of a pale corneous tint, the embryonic whorls being slightly roughened with weak arcuate wrinkles. There is a whitish line below the finely but indistinctly crenulate suture. The shell has not the gloss of *O. cuneus*, and the shape of the spire is quite different. Length 30, diam. 8, aperture 8.5 mm., diam. of second whorl 2.5 mm.; whorls 8½.

13. O. jousseaumei Cousin. Pl. 36, fig. 78.

Shell elongate, turriculate, with obtuse summit and rounded base; quite thin, fragile and transparent, ornamented with fine, close and quite irregular striæ, sometimes showing superficial spiral striæ, appearing to be the result of erosion. Yellow, more or less tinted with reddish or greenish-yellow. Whorls 9, regularly and slowly increasing, separated by a linear, sharply cut suture; early whorls nearly smooth, forming a stout obtuse apex; following whorls but slightly convex, the outline appearing as a straight line interrupted at intervals by the suture. Last whorl noticeably angular a little below the middle. The aperture is oval, a little angular posteriorly, and noticeably excised by the penult. whorl; peristome unexpanded, thin and acute. Columella nearly straight, a little stronger than the outer lip; parietal callus weak. Length 27, diam. 8, aperture 8 x 5 mm.

Ecuador: descent of Azagues to Molobog, in a shady ravine, under dead leaves, elevation about 2,400 meters (Cousin).

Obeliscus jousseaumei Cousin, Bull. Soc. Zoölogique de France, xii, 1887, p. 238, pl. 4, f. 1.

The description is somewhat abbreviated from that of

Cousin. It seems to be related to *O. haplostylus*, but the contour is wider, the spire more conic and regularly tapering.

14. O. PUSILLUS (H. Adams). Pl. 36, fig. 77.

Shell imperforate, turrite, rather thin, striate, slightly shining, pale tawny. Spire long, the apex rather obtuse; suture impressed, not margined. Whorls 7, rather flattened, the last one-fourth the total length, rounded basally. Columella slightly twisted above. Aperture small, oval; peristome simple, straight, the right margin slightly arcuate, columellar margin a little reflexed. Length 8, diam. 2 mm. (*H. Ad.*).

Eastern Peru (E. Bartlett).

Rumina (*Obeliscus*) *pusilla* H. Ad., Proc. Zoöl. Soc. Lond., 1866, p. 441, pl. 38, f. 1.

Colombian Species.

These aberrant forms require further study.

15. O. VIRESCENS (da Costa). Pl. 36, fig. 81.

Shell oblong-turrite, very thin, pellucid, glossy. Whorls 8, a little convex, the sutures impressed, longitudinally very closely raised-striate; columella pale, reflexed; lip simple, acute; epidermis thin, greenish. Aperture subelongate, one-third the length of the shell. Length 37, diam. 12, aperture 14 x 5.5 mm. (*da Costa*).

Colombia: Valley of the Cauca river.

Stenogyra (*Spiraxis*) *virescens* DA COSTA, Proc. Malac. Soc. Lond., iii, p. 82, pl. 6, f. 10 (July, 1898).

16. O. BLANDI (Pfeiffer). Pl. 36, figs. 83, 84.

Shell perviously and narrowly umbilicate, turrite, rather thin, obliquely closely thread-striate, opaque, calcareous; spire long, attenuate below the wide, obtuse apex; suture slightly impressed. Whorls 17, flat, the last about one-seventh the total length, subangular. Aperture slightly oblique, subtetragonal; peristome simple, unexpanded, the columellar margin a little reflexed above. Length 22, diam. nearly 7, aperture 4 x 3 mm. (*Pfr.*).

Colombia: Baranquilla, in the Andes (Bland).

Bulimus blandi Pfr., Proc. Zoöl. Soc. Lond., 1852, p. 85; Conchyl. Cab., p. 155, pl. 48, f. 15, 16; Monogr., iii, p. 397.

Pfeiffer thought this might be an immature shell. The figures certainly have the appearance of a young *Eucalodium* or *Cœlocentrum*. It is obviously not an *Obeliscus*.

17. O. peregrinus Pfeiffer. *Unfigured.*

Shell perforate, subfusiform-turrited, rather solid, striatulate, waxen. Spire convex-turrited, the apex rather obtuse, suture subcrenulate. Whorls 8½, a trifle convex, the last subequal to one-third the length, subcompressed at base.

Aperture oblique, oblong, angular at both ends; peristome simple, unexpanded, the margins converging, right margin arcuate, columellar margin nearly straight, dilated to the base of the aperture, flat, wide. Alt. 18, diam. 5⅔ mill.; aperture, alt. scarcely 6, width 3 mill. (*Pfr.*, from type in Cuming coll.). *Habitat unknown.*

Bulimus peregrinus Pfr., P. Z. S., 1855, p. 9; Monogr., iv, p. 457.—*B.* (*Obeliscus*) *peregrinus* Pfr., *olim.*; *B.* (*Peronæus*) *peregrinus* Pfr.-Cless., Nomencl. Hel. Viv., p. 255 (1878).

An unfigured form, the systematic position of which can only be ascertained by an examination of the type.

Antillean Obeliscus (Subgenus Stenogyra Shuttlw.).

With the possible exception of *O. salleanus* and *rangianus*, the following Antillean Obelisks belong to the subgenus *Stenogyra*, the type being *O. terebraster* (Lam.). The embryonic shell is oblong, with an obliquely truncate columella (pl. 37, fig. 103, *terebraster* from Loisa, Porto Rico). The adult has a more or less developed callus on the columella, such as we do not find in *Protobeliscus*. The group extends over eastern Cuba, Haiti and Porto Rico, but is wanting in Jamaica and western Cuba. The Cuban species are closely related and difficult to distinguish.

Key to species of Stenogyra.

I. Rather large species, 28 to 50 mm. long, 7 to 14 mm. diam.
  a. Surface without spiral striation; Cuban.
    b. Diam. contained 4 to 4½ times in length; 28 x 7 to 37 x 8 mm. *O. maximus*, no. 18.
    bb. Diam. more than one-fourth the length; very solid, the spire contracted above; larger. *O. m. princeps*, no. 18 *a.*
  aa. Surface with delicate spirals; cuticle yellow, somewhat lamellose in perfect shells; Haiti.
    b. Length 45-48 mm., about 4 times the diam. *O. salleanus*, no. 27.
    bb. Length 28-37 mm., 4½ to 5 times the diam. *O. s. disparilis*, no. 27 *a.*
    bbb. Wider, length 39, diam. 11 mm.; Mexico(?). *O. rangianus*, no. 28.

II. Smaller forms, less than 25 mm. long, or 6 mm. diam.
  a. Whorls *all* very convex; small, pale and thin shells. Haiti.
    b. Weakly striate; sutures of embryonic whorls crenulate; 13.7 x 3.7 mm. with 8½ whorls. *O. hendersoni*, no. 24.
    bb. Finely, distinctly striate; 11.2 x 3 mm. with 10 whorls. *O. simpsoni*, no. 25.
  aa. Later whorls more or less flattened, the earlier more convex.
    b. Pellucid, glossy, small and very slender, 7 x 2 to 10 x 2.3 mm. with 7 to 9 whorls. *O. swiftianus*, no. 26.
    bb. Very narrow, diam. contained 5 or 6 times in length, yellow, very obliquely striate; 20 to 24 mm. long, about 4 wide, with 10¾ to 12 whorls. *O. clavus*, no. 23.
    bbb. Wider species, diam. 4 to 4⅔ times in length.
      c. Yellowish; 23 x 5 to 24 x 5.5 mm., aperture 6 mm., with 9½ to 10 whorls. Porto Rico. *O. terebraster*, no. 22.

cc. Corneous Cuban species, less than 20 mm. long.

d. 14 x 3, aperture 3 mm., whorls 8; striæ strongly arcuate.

O. strictus, no. 19.

dd. 17 to 18 x 3.7 to 4 mm., whorls about 10, the second 1 mm. diam.

O. bacillus, no. 20.

ddd. 16 x 4 to 18.5 x 3.9 mm., with 8 to 9½ whorls; summit larger.

O. homalogyra, no. 21.

Species of Cuba and Porto Rico.

18. O. MAXIMUS (Poey). Pl. 31, figs. 1 to 6.

Shell imperforate, long-turrite, the apex rather obtuse; solid, white. Whorls 12, a trifle convex, the last less than one-third the total length. Columella somewhat twisted. Aperture oval-oblong, the peristome unexpanded, acute, the right margin arched outward, columellar margin narrowly reflexed, with no umbilical crevice. Length 37, diam. 8, aperture 8 x 4 mm. (*Poey*).

Cuba, exact locality not noted (Poey); Yateras, Santiago and Baracoa (coll. A. N. S. P.); Guantánamo, Santiago, Mayari and Sagua de Tánamo (Arango).

Stenogyra maxima POEY, Memorias sobra la Hist. Nat. Cuba, i, p. 422, pl. 34, f. 9-11 (1854).—ARANGO, Fauna, p. 90.—? *S. gigas* POEY, Memorias, i, p. 395 (name only).—*Bulimus gigas* Poey, PFR., Monogr., iv, p. 456; Novit. Conch., p. 372, pl. 87, f. 3, 4, 5, 6.

Poey's original figures are copied, pl. 31, figs. 1, 2. Figs. 3, 4 represent a specimen sent to Pfeiffer as typical, and agreeing well with one sent by Poey to Tryon. These shells are strong but thin, whitish-corneous or sometimes faintly yellow-tinted, distinctly contracted near the rather large apex. The surface is rather glossy and very weakly striate. Poey's original type was an unusually long specimen, exceeding in length any I have seen. The shell usually measures,

Length 30.5, diam. 7.8, aperture 8.1 mm.; whorls 10½.
Length 32, diam. 7.8, aperture 7.6 mm.; whorls 11½.
Length 28, diam. 7, aperture 7.1 mm.; whorls 10¼.
The diameter of the apex at the second whorl is 1.7 mm.

There is also a thinner form, almost translucent, but otherwise like the preceding, which has been noticed by Pfeiffer, and figured (see fig. 5). It is found at Yateras. An embryonic shell out of one of these is 3.5 mm. long with 3¾ whorls, with the axis imperforate and the columella strongly twisted spirally.

The name *S. gigas* was nowhere defined by Poey, but Pfeiffer applied it in the place of typical *S. maxima*, evidently because the latter name was in use in *Bulimus*.

18*a*. Var. PRINCEPS Pilsbry. Pl. 31, figs. 7 to 11.

Shell imperforate, *very solid*, white under a yellowish (or very thin pale greenish-yellow) cuticle; very weakly striate. Spire regularly tapering from the last whorl to the *upper fourth*, which *is decidedly contracted;* apex large and rounded, the width at the second whorl being 2 mm. Whorls 10½, very slightly convex, slowly and regularly increasing in length. Aperture moderately oblique, ovate, the columella rather narrow, vertical and straight.

Length 38, diam. 11, aperture 10.5 mm. Type.
Length 38, diam. 10.2, aperture 10 mm.; whorls 11½.
Length 35, diam. 9, aperture 9 mm.; whorls 10½.
Length 37, diam. 12, aperture 11 mm.; whorls 10.
Length 44, diam. 14 mm. (*Pfr.*, fig. 9).
Length 30, diam. 9, aperture 8.5 mm.; whorls 10.
Eastern Cuba: Monte Libano, etc.

Bulimus gigas Poey, var. *g*, PFR., Novit. Conch., p. 372, pl. 87, f. 1, 2.

This form differs conspicuously from typical *O. maximus* by its larger size, more robust form and greater solidity; yet there is great variation in these characters, and some specimens, such as that drawn in fig. 7, form a partial transition between the smaller and larger forms. One old specimen in the series of 16 before me has lost the apical whorls and closed the breach by a plug.

19. O. STRICTUS (Poey). Pl. 30, figs. 16, 17.

Shell corneous, rather solid, turriculate, imperforate, delicately striate; whorls 8, rather flat, the apex obtuse. Aperture small, trapezoidal; peristome acute, the right margin straight, posteriorly acutely angular; columella narrow, somewhat calloused. Length 14, diam. 3, aperture 3 mm. (*Poey*).

Eastern Cuba: Manzanillo, Bayamo and Cabo Cruz (Gundlach); a variety in the Isle of Pines (Gundlach).

Bulimus strictus POEY, Memorias, i, p. 205, 212, 447, pl. 26, f. 16-18.—PFR., Malak. Bl., 1854, p. 196; Monogr., iv, 459.—*Stenogyra stricta* Poey, ARANGO, Fauna, p. 91.—*Opeas strictus* Poey, STREBEL, Beitrag Mex. Conch., v, p. 107 (1882).

Poey's description and figures are given. It is a more slender species than *S. homalogyra*, with the last two or three whorls longer and even flatter, the upper slope of the last whorl being almost impressed or concave. The striæ are quite strongly arcuate.

I have seen no examples from the Isle of Pines, and feel disposed to doubt the identity of any form from there with the East Cuban *S. stricta*.

20. O. BACILLUS (Pfeiffer). Pl. 30, figs. 7, 8, 9, 10.

Shell imperforate, subulate, rather thin, slightly striatulate, diaphanous, waxen; spire lengthened, almost regularly tapering, the summit fine; suture light, sometimes obsoletely submarginate. Whorls 8 to 10, the upper ones convex, the lower flattened, last whorl about two-ninths the total length. Columella simple, very slightly twisted. Aperture oblique, oblong-oval; peristome simple, unexpanded, the right margin slightly dilated forward. Length (largest specimen) 18.5, diam. 3.75, aperture 3.66 x 2 mm. (*Pfr.*).

Eastern Cuba: between Demajagua and Guantánamo (type loc.); Guantánamo, under stones (Gundlach); Baracoa (Arango).

Bulimus bacillus PFR., Malak. Bl., viii, 1861, p. 221; Monogr., vi, 92; Novit. Conch., p. 424, pl. 96, f. 7-9.—*Stenogyra bacillus* Pfr., ARANGO, Fauna Mal. Cubana, p. 90.

"This species is readily distinguishable from *terebraster* and *homalogyra*, which have the columella similar, by the much narrower, quite regularly descending whorls" (*Pfr.*).

Pfeiffer's original figure is copied, figs. 7, 8, and two specimens are drawn, figs. 9, 10. These measure:

Length 17, diam. 4, aperture 4 mm.; whorls 10.

Length 17.8, diam. 3.8, aperture 3.9 mm.; whorls 10½.

The apex is small, 1 mm. in diameter at the second whorl, being smaller than in *terebraster*, and the spire is noticeably contracted above.

21. O. HOMALOGYRA ('Shuttl.' Pfr.). Pl. 30, figs. 13, 14, 15.

Shell imperforate, cylindric-turrite, striatulate, slightly shining, diaphanous, whitish-hyaline. Spire long, rather obtuse; suture light, submarginate. Whorls 8, slowly increasing, the upper four rather convex, the rest flattened, last whorl two-sevenths the total length, slightly tapering basally. Columella callous, somewhat twisted, receding. Aperture oblique, sub-semioval; peristome simple, unexpanded, the right margin receding basally, forming an angle with the columella. Length 16, diam. 4, aperture 4.5 x 2 mm. (*Pfr.*).

Central Cuba: near Trinidad, at the sugar plantation "Magua" and at the "Sitio del Quemado" (Gundlach), and on the hill "La Vigia" (Pilsbry); Sancti Spiritus around limestone rocks; on the hillside west of Matanzas (Pilsbry). Also reported from Almendares and Fermina.

Bulimus homalogyrus Shuttleworth mss., PFR., Conchyl. Cab., p. 91, pl. 31, f. 9, 10; Monogr., iii, 392; Malak. Bl., 1857, iv, p. 107.

The habitat was originally unknown, but as Trinidad specimens are typical, that may be considered the type locality. It occurs on La Vigia rather sparingly under stones. It is the common and characteristic *Obeliscus* of central Cuba.

Fig. 13 is a copy of the original illustration; figs. 14, 15 represent Trinidad specimens of the maximum size, enlarged to double natural size, showing the more slender and the wider phase. The suture is narrowly but deeply incised. The glossy surface is delicately but distinctly arcuate-striate,

the striæ stronger below the suture. The embryonic and early whorls are decidedly larger than in *S. bacillus*. The figured specimens measure:

Length 17, diam. 4.3, aperture 4.7 mm.; whorls 8½.

Length 18, diam. 4.2, aperture 4.4 mm.; whorls 9⅓.

The largest of an abundant series taken near Sancti Spiritus, Prov. Santa Clara, measures: length 17.5, diam. 3.9, apert. 4.5 mm., whorls 8½.

Var. *zaza* nov. Pl. 40, figure below fig. 4.

On the rocky hill at Zaza del Medio, Prov. Santa Clara, I found a slender form of the species. The very pale greenish-yellow shell is composed of 9 to 9½ whorls; the spire is more slender and tapers more regularly than in *O. homalogyra*, the lateral outlines being straight. In adult shells the later whorls have a white-bordered suture.

Length 18.5, diam. 3.9, aperture 4 mm.; whorls 9½.

Length 18, diam, 4, aperture 4.3 mm.; whorls 9.

Length 17.3, diam. 3.7, aperture 4 mm.; whorls 9⅓.

In *O. bacillus* Pfr. the early whorls are more attenuate than in these shells.

22. O. TEREBRASTER (Lamarck). Pl. 30, figs. 5, 6, 11, 12.

Shell cylindric-turrite, somewhat glabrous, corneous-brownish; whorls 9, flattened, the last more ventricose; lip thin, acute. Length 9 to 10 lines (*Lam.*).

Porto Rico (Mauge, type loc.). San Juan, Ceiba, Humacao and Luquillo (Blauner); Quebradillas, Vegabaja and Las Marias (Gundlach); Loisa (Swift).

? *Helix terebraster* FÉRUSSAC, Prodrome, p. 55, no. 370, no description.—*Bulimus terebraster* Lam., An. s. Vert., vi, pt. 2, p. 124, no. 28 (April, 1822); Edit. Desh., viii, p. 234.—MENKE, Zeitschr. f. Malak., 1853, p. 63.—PFR., Monogr., iii, 653.—*Stenogyra* (*Obeliscus*) *terebraster* Fér., SHUTTL., Diagnosen n. Moll., no. 6, p. 140, in Mittheil. naturf. Ges. Bern, 1854, p. 48.—*Stenogyra t.*, MARTENS, Conch. Mittheil., i, p. 94, pl. 17, f. 9-11; Jahrb. d. Mal. Ges., iv, 1877, p. 349; Nachrichtsblatt, xxiii, 1891, p. 132.—CROSSE, Journ. de Con-

chyl., 1890, p. 244 (Cuba).—*Obeliscus terebraster* Lam., Crosse, J. de C., 1892, p. 27.

This common Porto Rican species was very briefly described by Lamarck, but in 1853 Menke redescribed it, and more recently von Martens has supplied a good description and figures (figs. 11, 12). "The shell is turrite, weakly striate, thin, dull yellowish and slightly shining when fresh, whitish and shining when worn or rubbed. Apex rather obtuse; there are 10 rather flattened whorls, parted by a rather impressed suture, regularly increasing, the last rather rapidly tapering below. The aperture is hardly one-fourth the total length, rather oblique, obliquely piriform, acute above. Outer lip thin, unexpanded. Columellar margin almost vertical, narrow, only in the middle a little flattened, very narrow below and with an indistinct angle where it passes into the basal margin. Length 23, diam. 5, aperture 6 x 3 mm."

A larger specimen from Luquillo is figured, pl. 30, fig. 6, measuring, length 24, diam. 5.5, aperture 6 mm., with 9½ whorls. The specimen drawn in fig. 5, said to be from the same place, differs so much in proportions that I am disposed to think it a Cuban shell put with Porto Ricans by mistake. It measures, length 24, diam. 4.8, aperture 4.8 mm., whorls 11½.

Young shells shaken out of shells from Loisa are oblong, 3 mm. long, with 3 whorls and a sinuous columella (pl. 37, fig. 103).

In Eastern Cuba *O. terebraster* has been reported from Brazo del Cauta, Buenavista and Coralillo, all near Santiago, from Guantánamo, Bayamo and Baracoa. Pfeiffer states that those from Santiago are entirely like Porto Rican shells (Malak. Bl., v, p. 184). Some Cuban specimens before me seem indistinguishable from true *terebraster*. The anatomy of Cuban should be compared with Porto Rican examples. It is certainly remarkable that the same species should be common to Cuba and Porto Rico and unknown in the intermediate island of Haiti.

A sinistral *Obeliscus*, said to be from Porto Rico, is figured on pl. 32, fig. 31. It is not a reversed *O. terebraster*, but as the shell is immature, it may remain undescribed pending further information.

Haitian Species.

Achatina dunkeri Pfr., *Spiraxis* or *Euspiraxis dunkeri* of some authors, has a Stenogyroid appearance, but it is Oleacinoid, and the type of the genus *Dolicholestes* Pils., *q. v.*

23. O. CLAVUS Pilsbry, n. sp. Pl. 32, figs. 19, 20, 21, 22.

Shell imperforate, thin, pale yellow or yellowish, *glossy,* weakly and very obliquely striate. *Very narrow,* the diameter equal to the length of aperture, and contained five or six times in the total length of the shell, the lower three-fourths of the length slowly tapers or is almost cylindric, the upper fourth is slightly contracted, the apex obtuse. Whorls 11 (10¾ to 12), the apical one hemispherical, corneous, the following whorls slightly convex, slowly increasing, later whorls being more flattened and longer. The aperture is very oblique, ovate. The outer lip is a trifle sinuous, thin. Columella slightly concave, almost straight in the middle, narrowly calloused, curving regularly into the basal lip.

Length 20.6, diam. 3.9, aperture 3.9 mm., diam. at second whorl 1 mm. (figs. 21, 22, type).

Length 21, diam. 4.1, aperture 4.1 mm.

Length 24, diam. 4, aperture 4 mm.

Haiti: Sans Souci, near Cape Haitian (type loc.); Charmette; Cape Haitian (Henderson and Simpson).

This is a perplexing form of the *terebraster* group, collected in some quantity by Messrs. Henderson and Simpson. It differs from *terebraster* by its constantly narrow contour, none of the large series taken approaching Porto Rican *terebraster* in shape, though as usual in Stenogyrine snails, there is a wider and narrower phase, as shown in the measurements and on the plate.

Var. *flavus* nov. Pl. 30, fig. 18. A very closely related or specifically identical form occurs in Eastern Cuba at Santiago. Specimens are before me bearing the erroneous names *Subulina succinea* Gundl. and *S. megalogyra* Gundl., the latter received from Poey. They differ from the Haitian types in having the aperture a trifle longer and narrower, and the shell, when full grown, is slightly more solid and

opaque. The specimen figured (pl. 30, fig. 18) measures, length 24, diam. 4.1, aperture 4.8 mm., with 11½ whorls.

24. O. HENDERSONI Pilsbry, n. sp. Pl. 32, fig. 17.

Shell imperforate, thin, pale yellow, the earlier whorls sometimes corneous-whitish; glossy, weakly striate, the *striæ straight*, and slightly oblique. The spire tapers straightly to the obtuse summit. Whorls 8⅓ to 8¾, *all very convex*, regularly increasing, first 1½ whorls *regularly, finely crenulate at the suture;* subsequent whorls joined by a well-impressed but nearly even suture. Last whorl convex below. The aperture is small, slightly oblique, irregularly ovate; outer lip thin, not sinuous. Columella vertical, straightened and reflexed above, very indistinctly subtruncate before reaching the base. Length 13.7, diam. 3.7, aperture 3 mm.; diam. at second whorl 1.1 mm.

Haiti: Sans Souci, near Cape Haitian, type loc.; Port au Prince (Henderson and Simpson).

By its rounded whorls, like *Subulina octona*, this differs from all Antillean *Obelisci* except the following species. The crenulate suture of the embryonic whorls is a further distinguishing feature. Named for John B. Henderson, Jr.

25. O. SIMPSONI Pilsbry, n. sp. Pl. 32, fig. 18.

Shell imperforate, thin, corneous with a very thin pale yellowish cuticle, subtranslucent, finely *striate*, the striæ a little arcuate. The spire tapers straightly to the *very small obtuse apex*. Whorls 10, *all quite convex* and joined by a deeply impressed suture. Aperture small, somewhat oblique, ovate; the outer lip thin, arched forward a little above. Columella straight, somewhat oblique, obliquely subtruncate before reaching the base. Length 11.2, diam. 3, aperture 2.9 mm.; diam. at the second whorl .8 mm.

Haiti: Port au Prince (Henderson and Simpson).

This species, named in honor of Charles T. Simpson, closely resembles the slender Haitian form of *Opeas gracile* called *octonula* by Weinland, but differs totally from that in the structure of the columella; *octonula* being a typical *Opeas*,

while *O. simpsoni* is as unequivocally an *Obeliscus*. It is like *O. hendersoni* in the columella and convex whorls, but differs by its distinctly striate surface and smaller, much less obtuse apex, the suture of the embryonic whorls being smooth, while in *O. hendersoni* it is crenulate to the tip. By their markedly convex later whorls these two species differ conspicuously from all the small Cuban Obelisks. *O. simpsoni* has some resemblance to *Leptinaria striosa* (C. B. Ad.), but the parietal margin and columella are of a different shape.

26. O. SWIFTIANUS (Pfeiffer). Pl. 30, figs. 1, 2, 3, 4.

"Shell imperforate, subulate, thin, slightly striatulate, a little shining, diaphanous, waxen. Spire regularly tapering, the apex rather obtuse; suture light, simple. Whorls 7, a little convex, the last slightly exceeding one-fourth the length, rounded basally. Aperture oblique, oval-oblong; peristome simple, acute, the right margin arching forward, base receding; columellar margin somewhat calloused, very shortly reflexed. Length 7, diam. 2 mm., aperture 1.75 mm. long (*Pfr.*).

St. Thomas (Swift, type loc.). Porto Rico: San Juan, Fajardo, Ceiba, Humacao, Luquillo (Blauner); Quebradillas (Gundlach); Island of Vieque. St. John (Bland). St. Croix (Griffith). Guadeloupe and St. Martin (Maze). Cuba at Havana (R. Arango). Bermuda, near Tuckerstown (Heilprin *et al.*). Mauritius (Nevill, see p. 157).

Bulimus swiftianus PFR., Zeitschr. f. Malak., 1852, p. 150; Conchyl. Cab., p. 256, pl. 69, f. 9-11; Monogr., iii, p. 399; iv, 460; vi, 99.—*Stenogyra swiftiana* Pfr., SHUTTLEWORTH, Diagnosen, etc., no. 6, p. 140 (1854).—MAZE, Journ. de Conchyl., 1883, p. 7 (Guadeloupe); 1890, p. 23 (St. Martin).—*Obeliscus swiftianus* Pfr., CROSSE, Journ. de Conchyl., 1892, pp. 27, 62 (Porto Rico, Vieques).—*Spiraxis s.*, MARTENS, Jahrb. D. M. Ges., iv, 1877, p. 345.—*Opeas s.*, STREBEL, Beitrag, v, p. 107, pl. 17, f. 14.—PILSBRY, this vol., p. 157.—*Stenogyra gutierrezi* ARANGO, Contrib. Fauna Malacologica Cubana, p. 91 (1878).

I have examined numerous examples of this form from all

the islands mentioned above except Guadeloupe. It is distinguished by the wholly imperforate axis at all stages of growth, the columellar margin being very narrowly reflexed and closely appressed, leaving no trace of an umbilical slit. The columella is rounded and somewhat thick above, but tapers downwards, not reaching to the base, which recedes somewhat. Specimens from St. Thomas (pl. 30, figs. 1, 2) are usually not very glossy, adults measuring:

Length 8, diam. 2, aperture 2 mm., with 8 whorls.

Length 7.5, diam. 2, aperture 2 mm., with 7½ whorls.

Some of the original lot in the Swift collection are before me. As the above measurements show, the contour varies from a wider to a narrower phase.

Porto Rican shells are more glossy and translucent, with whitish suture and the whorls seem a little more convex. Those from Cuba, pl. 30, fig. 4, received from Arango as *S. gutierrezi*, are similar but a little more robust; one of the wider phase is illustrated, length 8, diam. 2.25 mm., whorls 7½. In Bermuda the shells are finely developed, length 10, diam. 2.3, aperture 2.1 mm., with as many as 9 whorls (pl. 30, fig. 3).

In the structure of the columella, this species is like *Obeliscus* rather than *Opeas;* but some approximation to the same form is found in *O. octogyrum*, a species with more flattened whorls and a larger embryonic shell. None of the specimens seen contain eggs, such as are commonly seen in *Opeas*. It is probably viviparous, like all Obelisci.

In Havana, Bermuda and Mauritius this species is apparently an immigrant, introduced by commerce, probably from Porto Rico.

27. O. SALLEANUS (Reeve). Pl. 40, figs. 1, 2, 3.

Shell imperforate, *solid* and strong, turrite, white under a *yellow cuticle* which is obliquely and *indistinctly streaked with brown*, and *when unworn is very shortly and densely lamellose* on the last whorl. Surface not glossy, finely substriate, and subobsoletely but *closely spirally striate*, the spirals most prominent in unworn shells, being chiefly cutic-

ular. The spire tapers very regularly to the obtuse summit, which is usually amputated and plugged in adult shells. Whorls remaining about 8 or 9 (according to Pfeiffer 11 in perfect shells), the earliest ones somewhat convex, the rest almost flat. The aperture is rhombic, rather oblique, lilac-tinted within; outer lip acute; columella vertical, straightened, but varying from slightly concave to a little convex in the middle. A thin film covers the parietal wall.

Length 45, diam. 11, aperture 11 mm.; truncate, whorls 9¼.

Length 41, diam. 11, aperture 12 mm.; truncate, whorls 9.

Length 48.3, diam. 13, aperture 13.2 mm.; truncate, whorls 8½.

Santo Domingo: Tablaso near San Cristobal (A. Sallé, large typical form), and Maniel (small form). Dondon, in northern Haiti (Rolle).

Bulimus salleanus Reeve, Conch. Icon., v, pl. 88, f. 657 (Feb., 1850).—Pfr., Monogr., iii, p. 397.—*Obeliscus salleanus* Rve., Crosse, Journ. de Conch., 1891, p. 149.

Reeve's figures (fig. 1) are 41-42 mm. long and apparently perfect at the apex. Those from Sallé before me (fig. 3) are a little larger, but have lost the tips. The largest I have seen were taken in Santo Domingo by Gabb (fig. 2), but he did not note the exact place. The species is remarkable for its spiral sculpture, as well as for the unusual size and solidity. The subgeneric position of the form is uncertain. It is not nearly related to the other Obelisks of the Antilles.

27*a*. Var. disparilis Pilsbry, nov. Pl. 40, fig. 4.

Shell very much smaller and thinner, with 10½ to 11 whorls, the apex generally perfect; early whorls usually more attenuate than in *O. salleana*. Yellowish, the cuticle when unworn very shortly pilose in spiral lines.

Length 30, diam. 6.4, aperture 7.3 mm.

Length 28, diam. 6.4, aperture 7 mm.

Santo Domingo City (H. Prime, type loc.), and other localities in S. Domingo.

O. salleanus var. *b, minor* Crosse, Journ. de Conch., 1891, p. 81, no description.

The young of *salleanus* is much more broadly conic than this form, which when adult has as many whorls as the largest *salleanus*.

Specimens from some places are as brightly colored as the large typical form, and the whorls are occasionally a little more convex than in the example figured. The largest before me (from the Henderson collection) measures, length 37, diam. 7, aperture 7.7 mm., with 11½ whorls.

28. O. RANGIANUS (Pfeiffer). Pl. 32, fig. 23.

Shell elongate, turrite, solid, heavy, very lightly arcuately substriate, marked with distant spiral lines; straw-colored, the apex white, rather obtuse, suture very lightly impressed. Whorls 11, flattened, the last slightly more than one-fourth the total length, rounded basally. Columella straight, callous, at the base of the aperture shortly and obliquely truncate. Aperture sub-semioval, pearly within; peristome simple, acute. Length 39, diam. 11, aperture 11.5 x 5 mm. (*Pfr.*).

Mexico (Lindon).

Achatina rangiana PFR., Proc. Zoöl. Soc., 1846, p. 115; Monogr., ii, 261.—REEVE, Conch. Icon., v, pl. 15, f. 65.—*Subulina? rangiana* Pfr., MARTENS, Biologia Centr. Am., Moll., p. 300.

I agree with Professor von Martens in suspecting the locality to be erroneous. It is likely to prove to be closely related to *O. salleanus*, perhaps only a stout form or variety of that snail. There seems to be no difference other than the wider basal whorl, and consequently more ample aperture of *rangianus*.

Subgenus PSEUDOBALEA Shuttleworth.

Pseudobalea SHUTTLW., Diagnosen neuer Mollusken, no. 6, p. 138, in Mittheil. naturf. Ges. Bern, 1854, pp. 46, 48, for *Stenogyra* (*Pseudobalea*) *dominicensis* = *hasta* Pfr.

Shell rimate or imperforate, *sinistral*, slender, composed of many (11 to 16) narrow, convex whorls; thin, the apical whorls smooth; aperture small, the columella concave or

weakly plicate at base, its edge reflexed. Viviparous. Type *O. hasta* Pfr.

The embryonic young shell has a raised spire and straight columella (pl. 40, fig. 5, *O. hasta*). The shape of the apex is so unlike other Obelisks that some ground exists for ranking *Pseudobalea* as a separate genus.

There are probably three species of *Pseudobalea*, one in eastern Cuba, another in northeastern Haiti, the third in Porto Rico; but the relations of the Haitian form to its fellows have not been worked out. Pfeiffer considered them all to belong to one species.

29. O. DOMINICENSIS (Pfeiffer).

Shell subperforate, sinistral, turrite, nearly smooth, glossy, olivaceous-corneous. Spire regularly tapering, the apex acute. Whorls 12, convex, the last subangular below the middle. Aperture vertical, suboval; peristome simple, unexpanded, the columellar margin vertical, narrowly reflexed. Length 11.5, diam. 3 mm., aperture 2.5 x 1.75 mm. (*Pfr.*).

Island of Haiti (Sallé, in Cuming coll.); Mont Diego Campos (Hjalmarson), in the northern part of the Republic of S. Domingo, at an elevation of 4,000 ft.

Balea dominicensis PFR., Proc. Zoöl. Soc. Lond., 1851, p. 148; Monogr., iii, p. 383; Malak. Bl., v, 1858, p. 153.—*Pseudobalea d.*, CROSSE, Journ. de Conchyl., 1891, p. 149.

The exact characters of the Santo Domingan form of *Pseudobalea* are not known; no specimens from the island of Haiti are accessible to me, and the original description, translated above, is not explicit as to the features of the columella. The original specimen was a small one, and Pfeiffer subsequently received much larger shells from Porto Rico, probably taken by Riise, which he considered the same as *dominicensis;* and he described these under the name *Bulimus hasta,* making his earlier name a synonym.

Var. HASTA (Pfeiffer). Pl. 32, figs. 28, 29, 30.

Shell slightly subrimate, sinistral, subulate, thin, striatulate under a lens, pellucid, tawny-corneous. Spire regu-

larly tapering, rather acute; suture very slightly margined. Whorls 15, a little convex, the last about one-seventh the length, subangular below the middle. Aperture oblique, angulate-oval; peristome simple, unexpanded, the columellar margin somewhat straightened, a little reflexed, adnate. Length 19, diam. 3, aperture 2.66 x 1.75 mm. (*Pfr.*).

Porto Rico: San Juan, Luquillo, Quebradillas, Vega baja, Caguana near Utuado (Blauner, Gundlach).

Bulimus hasta Pfr., Malak. Bl., iii, 1856, p. 45; Monogr., iv, p. 454. — *Stenogyra* (*Pseudobalea*) *dominicensis* Pfr., Shuttlw., Diagn. n. Moll., no. 5, p. 140.—*Pseudobalea d.*, Crosse, Journ. de Conch., 1892, p. 31.

This Porto Rican species differs from the Cuban *O. latus* by the slightly sinuous axis, as seen in opened shells (fig. 30), and by the low spiral lamella which encircles the base of the columella, as shown in fig. 29. It is scarcely visible in a front view of the shell. Just what relation exists between *hasta* and *dominicensis* I am unable to state; but until differences are found to exist, the former may temporarily be ranked as a variety.

The uterine young shell (pl. 40, fig. 5) has a conoidal and rather acute spire and a simple, nearly straight columella.

30. O. latus 'Gundlach,' n. sp. Pl. 32, figs. 24, 25, 26, 27.

Shell sinistral, imperforate or nearly so, very slender, thin, dull yellow, glossy, finely striatulate. Whorls 13 or 14, quite convex, the last angular or subangular at the periphery. Aperture oblique, ovate, outer lip thin and simple, columella simply concave, with reflexed edge; no perceptible parietal callus. Internal axis very slender and straight (fig. 26).

Length 14.6, diam. 3 mm., whorls 14.

Length 13.7, diam. 2.8 mm., whorls 13.

Eastern Cuba: coffee plantation Buenavista, 6 leagues from Bayamo; also various places in the jurisdictions of Baracoa, Guantánamo (Gundlach) and Mayari (Wright).

Pseudobalea lata Gundl., Poey, Memorias, ii, p. 8.—Pfr., Malak. Bl., v, p. 43 (no description).—*P. dominicensis* Pfr., Arango, Fauna, p. 89.—*P. hasta* in part, Pfr., Monographia,

l. c.—*Stenogyra d.*, Bland, Ann. Lyc. Nat. Hist. of N. Y., xi, p. 85 (viviparity).—*Stenogyra hasta* Pfr., Binney, Ann. N. Y. Acad. Sci., iii, p. 100, pl. 15, f. 1 (jaw), pl. 7, f. D (teeth).

No description or figure of this shell has hitherto been published, although there have been many references to it in the literature of Antillean snails. The shell differs from the Porto Rican *O. hasta* by its simply concave columella and straight internal axis. Its relation to the true *O. dominicensis* of Santo Domingo remains to be determined.

Subgenus Lyobasis Pilsbry, 1903.

Lyobasis Pils., Manual of Conchology, xv, p. 175 (April 9, 1903), for *gonostoma* and *paradoxa*, the former selected as type.—*Stenogyra, Opeas* and *Cylindrella* of authors.

The shell is spire-shaped, fusiform or column-shaped, *ribbed or rib-striate*, two embryonic whorls smooth, large. Whorls 9 to 13, the last normal or becoming free. Aperture piriform or narrowly ovate, very oblique. Axis straight in the earlier, becoming more or less sinuous in the last one or two whorls. Type *O. gonostoma.*

Distribution: Western Cuba. A very distinct group of diminutive Obelisks, inhabiting an area where no other forms of the genus occur. The shells are chiefly remarkable for their strong sculpture. Some of the species are markedly senile. They are illustrated on plate 33 and the lowest line on plate 31.

Key to species of Lyobasis.

a. Last whorl free in front, the peristome continuous.

b. 12 to 13 mm. long with 13 whorls, the last with a median spiral sulcus. *O. paradoxus*, no. 31.

*b*¹. 12 to 13 mm. long with 10 whorls, the last not mesially sulcate. *O. gonostoma*, no. 32.

*a*¹. Last whorl in contact, but with a continuous peristome in the adult stage; spire thick; rimate.

b. 14 to 15 x 3 mm., aperture 3 mm.; whorls 9½ to 10. *O. microstoma*, no. 33.

a^2. Last whorl normal; peristome interrupted; spire slender; imperforate; whorls 10 to 11.

b. Sculpture coarse, the rib-striæ oblique, strongly arcuate above; later whorls long.

c. 17 x 3.5 mm.; tapering; aperture about one-fourth the length. *O. gundlachi*, no. 34.

c^1. 14 to 15 x 2.4 mm.; pillar-shaped; aperture contained about 5½ times in length. *O. blandianus*, no. 35.

b^1. Sculpture finer, the rib-striæ nearly straight; whorls short.

c. Length 11 to 12, diam. 2 to 2.5 mm., aperture 2 to 2.25 mm.; whorls 10½ to 11. *O. angustatus*, no. 36.

c^1. Length 10, diam. 2.8, aperture 2.6 mm., whorls 9; columella truncate. *O. binneyi*, no. 37.

31. O. PARADOXUS (Arango). Pl. 33, figs. 32, 33.

Shell fusiform, rather thin, pale brownish-corneous, opaque, lusterless. Embryonic 2½ whorls smooth, the rest closely and regularly sculptured with nearly straight rib-striæ. Whorls 13, the last tapering downward, the next earlier four of nearly equal diameter, those above forming a tapering, attenuate spire, the summit slightly bulging and obtuse. The last whorl is divided by a median spiral furrow, above which it bulges conspicuously; the last half whorl is free, deviating downward and outward. The aperture is small, very oblique, acutely piriform; peristome continuous, obtuse, slightly expanded throughout, and retracted at the upper angle. Length 12.7, diam. at penult. whorl 2.3, length of aperture 2 mm.

Western Cuba: Puerta de la Muralla, Guane.

Cylindrella paradoxa ARANGO, Proc. Acad. Nat. Sci. Phila., 1881, p. 15, fig. in text (May 10, 1881).

This peculiar species differs from *O. gonostoma* by having more whorls, and by the rapidly tapering and deeply spirally sulcate last whorl. It shows senile characters in a high degree. Fig. 32 represents a cotype.

32. O. GONOSTOMA ('Gundl.' Pfr.). Pl. 33, figs. 34, 35, 36.

Shell subrimate, fusiform-turrite, rather thin, densely almost straightly plicate-striate, diaphanous, waxen. Spire long, slowly tapering, the apex obtuse. Whorls 10, a little convex, the last more or less free, carinated above, somewhat impressed laterally. Aperture oblique, angulate-piriform; peristome simple, continuous, a little expanded throughout. Length 13, diam. 2.33, aperture 2 x 1.5 mm. (*Pfr.*).

Western Cuba: Lagunillas de Consolacion, under stones (Wright).

Stenogyra gonostoma Gundlach mss., PFR., Malak. Blätter, x, 1863, p. 247.—ARANGO, Fauna Mal. Cubana, p. 92.—BINNEY, Ann. N. Y. Acad. Sci., iii, p. 100 (teeth).—*Bulimus gonostomus* PFR., Monogr., vi, p. 101; Novit. Conch., p. 374, pl. 87, f. 10-12.

A specimen from Lagunillas is drawn, fig. 34, 35. This shell is 12 mm. long, 2.5 wide, with a trifle over 10 whorls. In this typical form only the last third or less of the last whorl is free.

In another form of the species, also taken at Lagunillas by Wright, fully a half whorl projects free (pl. 33, fig. 36), and the shell often has an additional half whorl; length 12.3, diam. 2.3 mm. This form approaches the preceding species. The teeth of *O. gonostoma* are stated by Binney to resemble those of *Subulina octona* (Ann. N. Y. Acad. Sci., iii, p. 100).

33. O. MICROSTOMA ('Gundl.' Pfr.). Pl. 33, figs. 37, 38, 43, 44.

Shell imperforate, cylindric-turrite, closely rib-striate, little shining, waxen. Spire elongate, slowly tapering, the apex rounded. Whorls 9½, a little convex, the last slightly more than one-fifth the total length, slightly tapering basally. Aperture oblique, angulate-oval; peristome simple, unexpanded, the right margin a little arched forward, columellar margin somewhat calloused. Length 14, diam. 3, aperture 3 x 1.5 mm. (*Pfr.*).

Western Cuba: sugar plantation Esperanza, Pinar del Rio (Wright).

Stenogyra microstoma Gundlach mss., Pfr., Malak. Bl., x, 1863, p. 246; xi, 1864, p. 131; Monogr., vi, 96; Novit. Conch., p. 373, pl. 87, f. 7-9.—Arango, Fauna Malacologica Cubana, p. 91.

A thick-spired shell with straight but weak riblets and rather short whorls. Figs. 43, 44 are from Esperanza topotypes received from Wright.

Young shells are subperforate with a narrow, simply concave columella. As it approaches maturity, the columella becomes more concave and sinuous, so that a nearly full-grown shell viewed from below shows a small central hole, about which the columellar axis revolves (fig. 37). In a later stage (fig. 38) the upper part of the columella expands, standing free from the body, and only adnate near the upper angle of the mouth. This condition is followed by the adult stage, fig. 43, in which the inner lip (columella and parietal margin) is continuous and straightened, with a swelling or convexity in the middle. The axis, fig. 44, is straight above, becoming sinuous in the later whorls. A fully adult shell from the type locality measures, length 15, diam. 3, aperture 3 mm., with 10 whorls.

34. O. gundlachi ('Arango' Pfr.). Pl. 31, figs. 14, 16.

"Shell imperforate, subulate, solid, closely and arcuately plicate-striate, hardly shining, waxy-whitish. Spire long, regularly tapering, the apex obtuse. Whorls 10, somewhat flattened, the last not one-fourth the total length of the shell, slightly tapering basally. Aperture somewhat oblique, angular-elliptical; peristome simple, unexpanded, the margins joined by a callous, right margin slightly curved forward. Length 17, diam. 3.5, aperture 4 x 2 mm." (*Pfr.*).

Western Cuba: Viñales (Wright, type loc.); also Sumidero and Pan de Azucar (Arango).

Stenogyra gundlachi Arango mss., Pfr., Malak. Bl., x, 1863, p. 246.—Arango, Fauna, p. 90.—*Bulimus gundlachi* Ar., Pfr., Monogr., vi, 95; Novit. Conch., p. 374, pl. 87, f. 13-15.

I have figured topotypes received from Wright. The num-

ber of whorls is more commonly 11 than 10 in full-grown shells of 17 mm. length. The rib-like striæ are markedly sinuous, being rather strongly bent forward just below the suture. They are much more distinct before the shell has been cleaned, by reason of a thin coat of earth which adheres to the intercostal spaces. The first 2 whorls are smooth. The spire is markedly attenuate above, but the early whorls are not enlarged or bulging. It is a thin shell. While narrow, this is decidedly wider and more robust than the following species.

35. O. BLANDIANUS Pilsbry, n. sp. Pl. 33, figs. 41, 42.

Shell imperforate, *column-shaped, very slender*, moderately solid, of a pale yellowish-corneous tint. Surface lusterless, sculptured with *fine rib-striæ which are strongly arcuate just below the suture, then quite oblique* and straightened. The riblets are thread-like and narrower than the somewhat unequal intervals. Whorls 11, the first two smooth, forming a large and obtuse summit. The next 4 or 5 whorls are convex and increase slowly, and the remainder are of about the same diameter, and are somewhat flattened. The aperture is small and very oblique, ovate; outer lip thin and sinuous; columella thickened, concave; the parietal margin straight. Length 14.5, diam. 2.4, length of aperture 2.6 mm.

Western Cuba. Type 59069 A. N. S. P.

This species is related by its sculpture and apertural characters to *O. gundlachi*, but differs conspicuously in shape, being far more slender, with a smaller aperture. The later whorls are very long and obliquely coiled. It differs from *O. angustatus* by the longer whorls, curved riblets, etc.

36. O. ANGUSTATUS (Gundlach). Pl. 33, figs. 39, 40, 45.

Shell cylindric-subulate, imperforate, sculptured with nearly straight ribs. Whorls 11, subconvex. The apex obtuse. Aperture small, subrhomboidal. Columella straightened. Length 12, diam. 2.5, aperture 2 mm. long, 1.25 wide (*Gundl.*).

Western Cuba: Monte Rangelino, under stones and fallen leaves, type loc.; Hato Caimito (Gundl.).

Stenogyra angustatus GUNDLACH, in Poey's Memorias, ii, p. 15, pl. 2, f. 6, 7 (1856); and in Malak. Bl., iii, 1856, p. 41.—ARANGO, Fauna, p. 90.—*Bulimus angustatus* Gundl., PFR., Monogr., iv, p. 454.

The very crude original figure is copied, pl. 33, figs. 39, 40. Gundlach adds that it differs from its congenors by the lengthened form, small aperture and numerous whorls. It has as many whorls as *O. blandianus* in a considerably less length, and the riblets are said to be "*subrectis,*" while in *blandianus* they are conspicuously arcuate above. I have figured, pl. 33, fig. 45, a shell received from Bland as *angustatus*, which agrees fairly well with the description, though I would hardly call the surface ribbed. It is very finely rib-striate, much more densely and delicately so than *O. blandianus.* Length 11.3, diam. 2, length aperture 2.25 mm., diam. of second whorl 1 mm.; whorls 10¾; exact locality unknown. The rather large apex and attenuate spire give it a cylindrelloid appearance.

37. O. BINNEYI Pilsbry, n. sp. Pl. 31, fig. 15.

Shell imperforate, turrite, regularly and straightly tapering to the obtuse apex, thin. Surface rather glossy, closely and regularly sculptured with *straight, subvertical riblets* about as wide as their intervals. There are about ten of these riblets in the space of one mm. on the front of the last whorl. Whorls 9, the first 1½ smooth. The earlier 6 whorls are strongly convex, and the last two are flat peripherally. The suture is very deeply impressed. The aperture is nearly vertical, rhombic, narrow above and below. Columella vertical, rather strongly calloused, and more or less distinctly obliquely truncate at the base. Length 10, diam. 2.8, length of aperture 2.6 mm.; diam. at second whorl 1 mm.

Western Cuba: Isabel Maria (Chas. Wright).

This species is quite distinct by reason of its short whorls, regular taper, and the straight vertical rib-sculpture. It is named for Mr. W. G. Binney.

Genus NEOBELISCUS Pilsbry, 1896.

Neobeliscus Pils., Nautilus, x, p. 46 (August, 1896).—Pilsbry and Vanatta, Proc. A. N. S. Phila., 1899, p. 366 (anatomy).—*Obeliscus, Columna* and *Bulimus* sp. of authors.

Shell imperforate, large and solid, turrite, slowly tapering to a large conic summit. Aperture irregularly ovate, the outer lip acute and simple, columella vertical, its edge narrowly reflexed and adnate. Viviparous, the embryonic shell very large at birth, about one-fourth the length of the adult shell and exceeding one-third its diameter, with half the adult number of whorls, being composed of 5½, the first 1½ whorls smooth, forming a convexly-conic, obtuse summit, the rest densely and very finely striate; columella slightly concave, not in the least truncate. Type *N. calcarius.*

Distribution: Southeastern Brazil.

Neobeliscus was no doubt derived from *Obeliscus*, from which it differs in the great size of the embryos, which have a bluntly conic instead of hemispherical summit. Only two are contained in the uterus at one time, while in *Obeliscus* they are numerous and small. The columella of the embryonic shell is not truncate, resembling typical *Obeliscus* in this respect, and unlike *Protobeliscus, Rhodea* and *Stenogyra*, which retain the earlier feature of a truncate columella. The foot is very short and broad, squarely truncated behind; with no appearance of grooves or specialized granulation above the margins; sole undivided.

Genitalia (pl. 45, fig. 5) without accessory organs, the atrium short. Male system with a long, club-shaped penis with strongly folded internal walls, and terminal retractor muscle and vas deferens. Talon (fig. 4, *t.*) large, consisting of a swollen distal portion on a narrow, devious duct of similar length. The attached portion of the sperm-duct is composed of a dense mass of radiating tubules or cæca. Female system with the vagina rather short, spermatheca oblong, borne on a duct of about double its own length, and remote from the heart. Free oviduct as long as the spermatheca duct. Uterus with thin walls, enormously distended when

containing young, two of which occupy it at a time. The uterus in virgin or functionally inactive individuals is shrunken, and lies in numerous deep, regular, longitudinal plaits. When carrying young at almost full term it presents the appearance shown in fig. 5, the young lying with the head directed anteriorly, the ventral face toward the sperm duct.

Albumen gland (figs. 4, 5, *a. gl.*) very small, shorter than the talon and far smaller than the spermatheca. Median moiety of the hermaphrodite duct extravagantly convoluted and knotted.

Viviparous; the shell of the young at birth (pl. 45, fig. 6) is nearly one-fourth the length, and exceeds one-third the diameter of the adult shells, with half the number of whorls.

Retractor muscle system (pl. 45, fig. 7) somewhat resembling that of *Rumina;* right, left and tail retractors free except at the very insertion, where they are very shortly united. Tail retractor or columellar muscle very long; right retractor splitting up distally into (1) numerous anterior and lateral pedal retractors, (2) the retractor of the eye, and (3) the retractor of the penis. The left retractor gives rise (1) far anteriorly to the short pharyngeal retractor which is shortly bifurcate anteriorly, and (2) in front of this, splits into ocular and pedal retractors.

Lung (pl. 45, fig. 8) long and narrow, the venation faint, mainly concentrated anteriorly and consisting chiefly of fine parallel veins transverse to the pulmonary vein, which is otherwise unbranched. Heart normal. Kidney more than double the length of the pericardium, quite narrow, its length contained about 3½ times in that of the lung. Ureter retrograde, continued along the gut, closed throughout.

The jaw (pl. 45, fig. 3) is arcuate, densely striated, under strong magnification showing transverse striolation in its substance, crenulating the vertical striæ.

Radula composed of 44, 1, 44 teeth in slightly bow-shaped rows (pl. 45, fig. 1). Centrals very narrow, less than one-fourth the width of the adjacent laterals, and bearing no cusps in adult animals. Laterals with the basal plate wide and square, tricuspid, the median cusp broadly conic, not as

long as the basal plate, side cusps short and blunt. Marginal teeth with longer and blunt cutting points on the median, and more acute cutting points on the side cusps.

Salivary glands united above. Crop moderately swollen, stomach small, globose.

Relationships.—By its simplicity the penis differs from that of the *Achatininæ*, but its musculature is like that of *Atopocochlis, Achatina*, etc., the penial retractor being a branch of the right ocular band. The very large uterine young remind one of *Archachatina*. The absense of a cusp on the central tooth is an acceleration of the usual type in the family. In a uterine young individual the cusp of the central tooth was found to be developed, though small (pl. 45, fig. 2).

The myology offers some interesting characters. As in *Rumina* (figured in vol. xvii, pl. 65, fig. 45), the retractor of the pharynx (*ph. r.*) is short and branches from the left retractor band far forward. Unlike *Rumina*, it bifurcates. All three retractor bands are free to the proximal root, where they are very shortly though firmly united. This is unlike *Rumina*, in which the right retractor and the columellar muscle are united for a distance nearly as great as the free length of the latter.

Fig. 1. *Neobeliscus calcareus* (Born). Teeth of an adult individual. *m.*, median tooth; the side teeth are numbered. Fig. 2. Teeth of a uterine young individual (fig. 6). Fig. 4. Albumen gland (*a. gl.*), talon (*t.*) and beginning of the hermaphrodite duct (*h. d.*), of the same individual × 4, the organs separated. Fig. 5. Genitalia of an individual carrying two uterine young, the anterior one about at full term × 1¼. *a. gl.*, albumen gland; *atr.*, atrium; *h. d.*, hermaphrodite, or ovisperm duct; *r. r.*, right retractor muscle; *p. r.*, penis retractor; *p.*, penis; *sp.*, spermatheca; *t.*, talon; *ut.*, uterus. Fig. 6. Uterine young of the same, ventral aspect. *f.*, foot; *p.*, podocyst. Somewhat less than natural size. Fig. 7. Free retractor muscles, dorsal aspect. *br.*, branch of left retractor; *l. o. r.*, left ocular retractor; *l. r.*, left retractor; *p.*, penis; *ph.*, pharynx, or buccal mass; *ph. r.*, pharyngeal retractor; *p. r.*, retractor of the penis; *r. o. r.*, right ocular re-

tractor; *r. r.*, right retractor; *r. t. r.*, right tentacular retractor; *t. r.*, tail retractor. Fig. 8. Intestine and pallial region slightly less than natural size. G^{1-4}, first to fourth folds of the intestine; *g. ur.*, secondary ureter; *H*, heart; *k*, kidney; *p. v.*, pulmonary vein; *st.*, stomach; *ur.*, ureter.

N. CALCARIUS (Born). Pl. 36, figs. 73, 74.

Shell imperforate, turrite, *solid*, yellow or brownish-yellow, the last three whorls profusely streaked and suffused with chestnut; usually with some blackish growth-arrest streaks on the last whorl; earlier four or five whorls whitish from loss of the cuticle. Whorls 10, convex, the last 5 or 6 marked with growth-lines and very finely striate spirally, the spirals cutting the growth-striæ into fine granules and festoons. Earlier whorls very densely, sharply striate vertically in the young, worn in the old shells. Aperture vertical, ovate, pale purplish-blue inside. Columella vertical, straight, rounded, with a reflexed and appressed outer edge. Parietal callus very thin and transparent. Outer lip thin, acute.

Length 106, diam. 32 mm.; aperture 30.5 mm.

Length 112, diam. 30 mm.; aperture 28 mm.

Brazil: Prov. of Para, in woods (Spix); Caxaprego Island, at the mouth of the Jagoaripe (Moricand); Province of Bahia (v. Ihering).

Helix calcaria BORN, Testac. Mus. Vindobon, p. 389, pl. 16, f. 13 (1780).—*Bulimus calcareus* Brug., WAGNER, in Spix, Test. Bras., p. 10.—REEVE, Conch. Icon., v, pl. 52, f. 342.—DESH. in Fér., Hist., ii, p. 112, pl. 142 A, f. 1, 2.—PFR., Monogr., ii, 151; iii, 395; iv, 455; vi, 94; Conchyl. Cab., p. 109, pl. 34, f. 4.—HIDALGO, Journ. de Conchyl., 1870, p. 55.—*Neobeliscus calcareus* PILS. & VAN., Proc. A. N. S. Phila., 1899, p. 366, pl. 15, f. 1, 2, 4-7; pl. 16, f. 9, 14 (anatomy).—*Helix calcaria* DILLWYN, Descr. Catal., ii, p. 948.—*Helix caxapregana* MORICAND, Mém. de la Soc. de Phys. et d'Hist. Nat. de Genève, vii, 1836, p. 426 (proposed as substitute for *Columna maritima* Spix).—*Columna maritima* SPIX, Test. Bras., pl. 10, f. 1 (1827).—*Bulimus maritimus* DESH. in Lam., An. s. Vert., viii, p. 250.—*Bulimus obeliscus* POT. et MICH., Galerie, i, p. 148, pl. 13, f. 17, 18.

This fine species is readily distinguished from the large species of *Obeliscus* by its broader shape and thicker, clumsy summit. Moricand states that it is found in virgin forest, especially under the fallen leaves of *Bromelia*, and attains a length of 120 mm., with 11 whorls. Pfeiffer records a specimen measuring 125 mm. long, 30 wide, aperture 29 mm., but these are exceptional dimensions, not reached by any shell in a large series before me. Born gives the length of his specimen as 3 inches 11 lines, about 98 mm.

The uterine young (pl. 37, fig. 99, nat. size) are yellowish-corneous, subcylindric with conic summit, and consist of 5½ whorls, of which the first 1½ are glossy and almost smooth, the rest covered with excessively fine and close striæ, giving it a silky luster. The base is glossy. Length 22, diam. 11 mm.

Genus LEPTINARIA Beck.

Leptinaria Beck, Index Molluscorum, p. 79 (1839).—Shuttleworth, Mittheil. nat. Ges. Bern, 1854.—Crosse & Fischer, Miss. Sci. Mex., Moll., i, p. 622 (anatomy of *L. lamellata*).—*Nothus* Albers, Die Heliceen, 1850, p. 168, sole species *B. anomalus, Achatina anomala* Pfr. Not *Nothus* (*Coleoptera*) Olivier, 1811, or of Billberg, 1820 (*Lepidoptera*).—*Lamellaxis* Strebel, Beitrag Mex. Land- und Süsswasser-Conch., v, p. 109 (1882), first species *L. mexicanus* Pfr.

Shell ovate, oblong or turrite, perforate or imperforate, thin, usually whitish-corneous, somewhat pellucid, composed of 5 to 11 convex whorls. Embryonic shell smooth, with rounded summit (except in the subgenus *Pelatrinia*). Aperture ovate, the columellar margin reflexed, *near the base twisted, and notched or truncate;* outer lip thin and simple; parietal wall sometimes bearing an entering lamella.

Jaw thin, arcuate, finely striate vertically.

Reproduction ovo-viviparous in the typical forms, but in others by eggs similar to those of *Opeas* and *Subulina.*

Dentition.—In *L. lamellata* the radula has nearly horizontal rows of 16, 12, 1, 12, 16 teeth. The middle tooth is

very narrow and tricuspid. The laterals are tricuspid, but the inner cusp is obsolete or even completely wanting. The middle cusp lengthens notably towards the sides of the radula. The marginal teeth are very small, short, bicuspid or tricuspid, the cusps subequal. The chief peculiarity of this radula is the extreme elongation of the outer lateral teeth (pl. 51, fig. 4, *L. lamellata*, after Fischer).

L. gloynii, of the section *Neosubulina*, has been shown by Binney to have similar median teeth, but he does not mention the outer marginals. See pl. 51, fig. 3, central and first lateral teeth.

Leptinaria was proposed by Beck for five species, of which only the first, *L. unilamellata* (= *L. lamellata*), had been defined. The next two, *L. lacryma* Beck and *L. succinealis* Beck, from Juan Fernandez, both undescribed, were probably members of the genus Tornatellina, while *L. soluta* Beck and *L. sorgum* Beck, from Guinea, are undescribed forms of unknown identity.

Nothus Alb. comprised one species of simple *Opeas*-like form; but the name was preoccupied. *Lamellaxis* of Strebel included the similar forms, *mexicana* Pfr., *modestus* Streb., *salleana* Pfr., *venezuelensis* Pfr., *aequatorius* Mill., *imperforatus* Streb., *filicostatus* Streb., *striosus* Ad., and *paludinoides* Orb. *S. mexicanus* Pfr. was selected as the type by Fischer, Manuel de Conchyliologie, p. 488. The term may be retained in a subgeneric or sectional sense for the forms reproducing by eggs, and without a parietal lamella, with *L. mexicana* as the type.

Leptinaria chathamensis Dall, 1892, has been shown to belong to *Tornatellina; cf.* Dall, Proc. A. N. S. Phila., 1900, p. 95.

Bulimus pupoides Anton, Verzeichniss, p. 42, no. 1535, from "Opana in South America," may be an *Opeas* or *Leptinaria*, or possibly a *Paludestrina*. It is scarcely to be identified.

In the Orient, *Bulimus plicifer* Bs. (see p. 63) has some characters of *Leptinaria*. It has been considered a *Buliminus* by Kobelt (Conch. Cab., *Buliminidæ*, p. 688), but with doubt.

The resemblance should be noted of the lengthened oviparous *Leptinarias* to certain forms still included in *Opeas,* section *Tomopeas* (p. 123). These Eastern forms may really belong to *Leptinaria,* yet I hesitate to transfer them until more is known of the soft anatomy of *Leptinaria* and *Opeas.*

Leptinaria is an extensive and widely-spread genus in tropical America. It comprises shells of widely diverse shapes, yet excepting the aberrant groups *Ischnocion* and *Pelatrinia,* the extremes are closely connected by intermediate forms. Some of the species closely resemble *Subulina;* others approach *Opeas;* so that the reference of certain species to one or another of these groups becomes a matter of opinion rather than of demonstration in the present stage of our knowledge. The resemblance to *Ochroderma* is more superficial, that genus having diverse characters in the early whorls. *Tornatellina* differs fundamentally from *Leptinaria* in dentition, as Binney and Fischer have shown.

The species are numerous, many of them critical and difficult to diagnose; and the more widely distributed forms have been described and named again and again. Many nominal species have been herein reduced to synonyms; but I have in each case given the evidence for my views. The excellent work of von Martens has been followed in dealing with the Mexican and Central American forms.

The series before me demonstrates, against my preconceived opinion, that *some species* vary from completely imperforate to openly perforate. This is notably the case with the Antillean ovate forms. The size and length of the parietal lamella, when present, are also variable among individuals of the same colony. In some species (as *L. stolli*) a parietal lamella is present in the young, but not in adult shells; other forms (*L. lamellata*) have the parietal lamella at all stages of growth from the embryo on. This subject calls for further investigation with good series of shells from young to the adult stage. It is only by such studies that the relations and significance of the species can be ascertained.

Key to Subgenera and Sections.

I. Embryonic whorls smooth.

a. Shell *ovate*, the 5 to 8 whorls rapidly increasing; parietal lamella present or wanting; viviparous. Subgenus LEPTINARIA *s. str.*, nos. 1 to 41.

b. Shell imperforate, turrite or ovate, of 6 to 10 slowly increasing whorls; no trace of a parietal lamella; oviparous. Sect. *Lamellaxis.*

c. Shell *turrite*, of 8 to 10 whorls; parietal lamella long. Sect. *Neosubulina*, no. 42, 43.

d. Shell pillar-shaped, with large apex and 11 slowly widening whorls; aperture triplicate. Subgenus ISCHNOCION, no. 44.

II. Embryonic whorls vertically striate. Subgenus PELATRINIA, no. 45.

Subgenus LEPTINARIA.

The distinction between typical *Leptinaria* and the section *Lamellaxis* cannot be made in all cases, with our present knowledge. The latter group is therefore included here.

Species of the Antilles and Trinidad.

L. lamellata is the most widely distributed form of this area, and will probably be found on nearly all the islands, though it has not yet been reported from Cuba or Haiti. It has an extensive distribution in South America.

1. Parietal lamella present. *Lamellata*, no. 1.
2. No parietal lamella.

a. Shell ovate, the diam. about half the length; whorls 5½ to 6½. *Monodon*, no. 2; *pallida*, no. 3.

aa. Shell oblong-conic or turrite, the diam. contained 2½ to 3 times in the length; whorls 6½ to 7.

b. Narrowly turrite; aperture one-third the length. *Abdita*, no. 5*a*.

bb. Oblong-turrite, aperture larger. *Salleana*, no. 7; *paludinoides*, no. 4.

aaa. Shell turrite, imperforate, Subulina-like; diam. less than one-third the length; whorls 8 to 10.

b. Greater Antilles. *Striosa*, no. 5; *gracilis*, no. 6.
bb. Trinidad. *Simplex*, no. 8; *urichi*, no. 9.

1. L. LAMELLATA (Potiez et Michaud). Pl. 42, figs. 39, 40; pl. 43, fig. 50.

Shell ovate, ventricose, fragile, very pale corneous, transparent, obsoletely striate. Whorls 6, convex, the last is much larger than the others. Aperture ovoid; columella bearing a decurrent lamella, which disappears within the aperture. The truncation forms a strong projection into the aperture by reason of the inflection of the columellar margin. Peristome simple and acute, summit a little obtuse. Length 15, diam. 6 to 7 mm. (*P. et M.*).

Jamaica (fig. 50), Porto Rico, Tortola, Guadeloupe, Dominica, Barbadoes, Trinidad, Demerara. See below for further localities.

Achatina lamellata P. et M., Galerie des Mollusques ou Catal. Moll. et Coq. du Mus. de Douai, i, p. 128, pl. 11, f. 7, 8 (1838).—*Leptinaria l.*, MAZE, Journ. de Conchyl., 1874, p. 159 (Martinique); J. de C., 1883, p. 8, 42, 47, 52 (Guadeloupe and dependencies); 1890, p. 23 (St. Bartholomew).—SMITH, Proc. Malac. Soc. Lond., i, p. 309, 318, 322 (St. Vincent, Grenada, and Becquia, Grenadines).—*Leptinaria antillarum* SHUTTLW., Diagn. n. Moll., no. 6, p. 142, in Mittheil. naturforsch. Ges. Bern, 1854, p. 50.—CROSSE, Journ. de Conchyl., 1892, p. 30.—*Tornatellina a.*, PFR., Monogr., iv, 650.—*L. funcki* Pfr., TATE, Amer. Journ. of Conch., iv, 1868, p. 189 (Grenada).—*Helix unilamellata* Fér. in coll.; ORBIGNY, Mag. de Zool., 1835, p. 9.—*Bulimus unilamellatus* ORB., Voy. dans l'Amér. Mérid., p. 257 (prior to 1842).—*Tornatellina u.*, PFR., Monogr., iii, p. 527.—*Tornatellina ferussaci* PFR., Symbolæ ad Hist. Hel., ii, p. 124, 130, name proposed as substitute for *B. unilamellatus* Orb., without description (1842); Monogr., ii, p. 394.—*Achatina funcki* PFR., Proc. Zool. Soc., 1847, p. 232; Monogr., ii, 271.—*Tornatellina funcki* PFR., Monogr., iii, 523; iv, 650; vi, 262.—HIDALGO, Viaje al Pacif., p. 139 (Guayaquil).—MARTENS, Binnen-Moll. Venez., p. 36.

—*Achatina lamellata* Reeve, Conch. Icon., v, pl. 18, f. 97 (according to Pfr.). — *Tornatellina blandiana* Pfr., Malak. Bl., xiv, 1867, p. 198; Monogr., vi, p. 262. — *Leptinaria b.*, Crosse, Journ. de Conch., 1890, p. 46.—Bland, Amer. Journ. of Conch., iv, p. 185 (Port of Spain, chiefly among decayed wood, etc.; also on the tops of trees in the forests, *Gill*).

The diagnosis given by Potiez and Michaud applies well to the common Antillean form, except in dimensions; but I think the "15 mill." of the description is an error for 13 mill., since shells of this length have the diameter assigned, 6 or 7 mm. The figures of P. and M. were drawn from a smaller shell, 10 x 5 mm. The habitat was unknown to them.

The shining surface is very densely and finely arcuate-striate. There are 5½ to 6 convex whorls. The outer lip is arched forward, and usually has a white thickening within. The columella is strongly twisted, the axis typically *imperforate*. In the middle of the parietal wall a low lamella stands, usually short, but sometimes so long that its inner end cannot be seen in the mouth. This lamella seems to vary widely, but is more frequently wanting or very small in adult than in young individuals. I have seen specimens from all the localities mentioned in the habitat paragraph above. Some others are noted in the reference paragraph.

The uterine young, taken from an opened shell, is globose, with the columellar truncation and parietal lamella well developed, pl. 40, fig. 17.

The original descriptions of synonyms follow.

Tornatellina blandiana. "Shell covered subperforate, ovate-conic, rather solid, irregularly wrinkle-striate, little shining, whitish waxy. Spire conic, the apex a little obtuse; suture deep, lightly margined. Whorls 6 to 6½, convex, the last about three-sevenths the total length. Aperture slightly oblique, sinuate-semioval, modified by a *strong subhorizontally entering lamella.* Columella short, obliquely truncate; peristome simple, the right margin unexpanded, arching forward, columellar margin reflexed, appressed. Length 12.66, diam. 6, aperture 6.3 x 3 mm. Trinidad (*Pfr.*).

Leptinaria antillarum. Shell imperforate, oblong-conic,

very finely striatulate, pellucid, very glossy, waxen. Apex obtuse. Whorls 6, a little convex, the last five-twelfths the total length; suture deep, very narrowly margined. Aperture semioval; parietal wall bearing one thin entering lamella; peristome simple, acute, the right margin slightly arched forward, basal margin subeffuse, columella twisted inward, callously truncate above the base. Length 12, diam. 5.5, aperture 5.5 x 3 mm. Humacao, Porto Rico (*Shuttl.*).

B. unilamellatus Orb. Shell elongate, white or slightly yellow tinted, a little ventricose, thin, diaphanous, smooth or lightly marked with striæ. Spire conic, obtuse at the summit, composed of 7 slightly swollen whorls, the last occupying more than half the length of the shell. Aperture oval, a little oblique, with sharp, simple margins. A projecting lamella occupies the base of the columella and is continued into the interior of the shell. Columella twisted with an acute projection, truncate below. Length 12, diam. 11 mm. Last foothills of the Andes of Bolivia, at Petaca, near the Rio Piray, 20 leagues from Santa Cruz de la Sierra (*Orb.*).

Achatina funcki Pfeiffer. Shell subperforate ovate-conic, thin, striatulate, glossy, pellucid, clear straw-colored. Spire conic, acute. Whorls 6, convex, the last a little shorter than the spire. Aperture semioval; parietal wall provided with an entering fold in the middle. Columella lamellate-truncate in the middle. Peristome simple, acute. Length 12.5, diam. 6, aperture 6 x 3 mm. Province of Merida, New Granada, Funck (*Pfr.*).

Var. *concentrica* (Reeve). Pl. 46, figs. 1, 2, 3, 4.

"Shell acuminately ovate, whorls 6, concentrically plicately striated, columella short, twisted, abruptly truncated, furnished at the upper part with a callous ridge, aperture rather small; horny, dull olive. Finely sculptured by numerous arched concentric striæ, whilst the body-whorl is furnished with a winding callous ridge. Bolivia, under dead cacti, Bridges (*Reeve*).

South America, from Bolivia northward.

Achatina concentrica Reeve, Conch. Icon., v, pl. 19, f. 106

(June, 1849).—*Leptinaria valenzuela* Jouss., Bull. Soc. Zool. de France, xii, 1887, p. 170, pl. 3, f. 4.—*Achatina lamellosa* Moricand, Reeve, Conch. Icon., v, pl. 19, f. 107 (June, 1849).

The form with *widely-spaced, arcuate riblets* on the spire may perhaps be distinguished varietally from *L. lamellata,* under the above name. It is chiefly South American, though specimens with distant costellæ may also be found among the specimens from Barbados, Porto Rico, etc.

Reeve's type (fig. 3) was from Bolivia. I figure a specimen, fig. 1, from Raiz do Serra, Sao Paulo, Brazil (v. Ihering). Others are before me from Trinidad, Demerara, Surinam, San Estevan, Pto. Cabello, Venezuela, Marmato Colombia, etc. Most of these specimens are imperforate, but a narrow perforation appears in some individuals.

Long variety, pl. 46, figs. 2, 4. A series of ten from Caracas consists of much lengthened shells with as many as 7½ whorls. There are inconspicuous, widely-spaced riblets on the spire, and the parietal lamella is small or even wanting. Three are imperforate, the others narrowly umbilicate or rimate.

The following are synonyms of *concentrica.*

"*Achatina lamellosa.* Shell acuminately ovate, whorls 6, somewhat rounded, very finely concentrically plicately lamellated, columella twisted, slightly truncated, furnished at the upper part with a small ridge; transparent, horny. A very transparent shell, most delicately concentrically lamellated. Hab. . . . . ?" (*Reeve*).

Leptinaria valenzuela Jousseaume, from Coca, Ecuador, is a synonym of *concentrica.* It is described as with widely spaced, slightly projecting striæ parallel to the lip-edge, and a parietal lamella. It measures, length 10, diam. 4.5, aperture 4 x 3 mm., with 6 whorls. M. Jousseaume does not compare it with any of the described species.

2. L. monodon (C. B. Adams). Pl. 43, figs. 41, 42.

"Shell ovate-conic; dingy white; with some slight striæ of growth; spire with the outlines somewhat convex; apex subacute; whorls nearly five and one-half, a little convex and

shouldered, with a well-impressed suture; last whorl large and wide, sometimes a little constricted near the aperture, which is rather wide, ovate, moderately acute above; labrum thin and sharp; columella straight, with an oblique tooth near its extremity; umbilicus very small. Mean divergence 45°; length .25 inch; breadth .15 inch; length of aperture .13 inch'' (*Adams*).

Jamaica (C. B. Ad.). Constant Spring, St. Andrew (Gloyne).

Bulimus monodon C. B. Ad., Contributions to Conchology, no. 2, p. 28 (Oct., 1849).—Pfr., Monogr., iii, 389.—Gloyne, Journ. de Conchyl., 1875, p. 119.—Nameless in Reeve, Conch. Icon., v, *Bulimus*, pl. 84, f. 119.

Adams type lot contains some imperforate shells besides the true *monodon*. Two of his largest individuals of the latter are figured, figs. 41, 42, measuring—

Length 8, diam. 4, aperture 4 mm., whorls 6½.

Length 7, diam. 3.9, aperture 3.2 mm., whorls barely 6.

The shell is pale buff-corneous, or bluish-corneous on the back of the last whorl; umbilicate, striatulate, with sharper striæ below the suture, about as in *L. pallida*. The spire is decidedly stouter than in *L. pallida*, its sides diverging at about 45 to 50 degrees; it appears somewhat gradate or terraced, the sutures being narrowly and deeply impressed. The last part of the last whorl is flattened above, often with a slight groove on the flattened surface parallel to the suture. The outer lip arches slightly forward. Columella short, white, very strongly truncate obliquely.

This species is very closely related to *L. pallida*, and may prove to intergrade with that, but typically it is stouter in figure, with the spire shorter and *more broadly conic*, and it has a more strongly truncate columella. It also attains to greater size, and is typically more openly perforate.

Porto Rico Form.—*L. stylodon* Shuttleworth. Shell minutely, falsely perforate, ovate-conic, very finely arcuately striate, pellucid, waxen. Spire rather acute; whorls 6, somewhat flattened, the last wide, flattened, three-sevenths the total length; suture rather deep. Aperture subauriform;

peristome simple, the right margin acute, arched a little forward; columellar margin shortly reflexed, spreading, basal somewhat thickened. Columella intorted, strongly callused-truncate in the middle. Length 7, diam. 4, aperture 3 x 2.5 mm. (*Shuttl.*).

Porto Rico: very rare at Humacao, under dead wood (Blauner).

Leptinaria stylodon Shuttl., Diagn. neuer Moll., no. 6, p. 142, in Mittheil. naturforsch. Ges. in Bern, 1854, p. 50.—Crosse, J. de C., 1892, p. 30.—*B. stylodon* Pfr., Monogr., iv, 451.

"Related to *B. monodon* C. B. Ad., from which it differs by the larger size, rather flattened, not convex whorls, the more acute spire, more expanded columellar margin and thicker columellar tooth" (*Shuttl.*).

This form probably cannot be separated even varietally from the Jamaican *L. monodon*. The supposed differences indicated by Shuttleworth are of little importance.

Var. opalescens Shuttleworth. Pl. 43, figs. 48, 49.

Shell imperforate, oblong-conic, striatulate, pellucid-hyaline, glossy. Spire with obtuse apex. Whorls 6, a little convex, the last rotund, three-sevenths the total length; suture quite deep. Aperture semioval; peristome simple, acute, the right margin arching a little forward; columella arcuately callous-intorted, towards the base obliquely strongly truncate, with a somewhat impressed area outwardly. Length 5, diam. 2.5, aperture 2 x 1.25 mm. (*Shuttl.*).

Porto Rico: San Juan, Ceiba and Humacao.

L. opalescens Shuttl., Diag. n. Moll., no. 6, p. 142, in Mittheil. Bern, 1854, p. 50.—*Bulimus* (?) *o.*, Pfr., Monogr., iv, 452.

Related to the preceding [*L. stylodon*] but quite distinct, as noted above. Animal buff (Shuttl.). The specimen of *L. opalescens* from San Juan, figured on my plate (fig. 48), is practically identical with the imperforate form from Jamaica, which I have found in the same lots with *L. monodon*.

Jamaican Form (pl. 43, fig. 49). Shell imperforate,

ovate, whitish-corneous, finely and weakly striatulate, spire conic, the apex obtuse, whorls 5, convex, the last well rounded peripherally and quite convex at the base. Suture narrow, deeply impressed. Aperture slightly oblique, the outer lip very slightly arched forward above. Columella very short, vertical, very strongly truncate below, the truncation accentuated by a low spiral lamella. Length 5.5, diam. 3, length of aperture 3 mm.

Jamaica.

This form differs from *L. monodon* by the closure of the umbilicus, which is complete in most specimens seen, but in a few there remains a minute chink behind the reflexed columellar lip. With the shape of *L monodon*, this form has the columellar structure of *L. pallida*.

3. L. PALLIDA (C. B. Adams). Pl. 43, figs. 44, 45, 46, 47.

Shell small, thin, diaphanous, corneous, elongate; whorls 5, convex; lip thin; columella straight. Divergence 35 degrees. Length of spire .16, total length .27, width .13 inch [6.75 x 3.25 mm.] (*Ad.*).

Jamaica (C. B. Adams). Westmoreland (Chitty in Swift coll.).

Bulimus pallidus C. B. AD., Synops. Conch. Jamaicensium in Proc. Bost. Soc. Nat. Hist., ii, 1845, p. 12.—PFR., Monogr., ii, 161; vi, 100.—Nameless in REEVE, Conch. Icon., v, *Bulimus*, pl. 84, f. 120.

This species differs from *L. monodon* by its more lengthened, narrower spire, the sides diverging at an angle of about 35 degrees, while in *L. monodon* the angle is about 45 to 50 degrees.

The type lot contains some specimens of the narrowly umbilicate form together with several typical *L. pallida*. There are also in the Adams collection specimens from Westmoreland, taken by E. Chitty, similar to those in the Swift collection from the same place and collector, fig. 45. These shells are imperforate or very narrowly rimate, oblong-ovate, whitish-corneous. Spire conic, much elevated, the summit obtuse. Whorls 5½ to 6, convex, parted by a narrow, deeply im-

pressed suture, the last whorl well rounded, very convex basally. Aperture hardly oblique, ovate, the outer lip a trifle arched forwardly above. Columella very short, vertical, deeply truncate obliquely at base.

Length 4.9, diam. 2.3, aperture 2.2 mm.

Length 5.5, diam. 2.7, aperture 2.4 mm.

Figs. 44, 46, 47 are from examples in C. B. Adams' collection, one measuring 5 x 2.7, aperture 2.4 mm., with 5½ whorls; the other 6.2 mm. long. Some other individuals in coll. A. N. S. without exact locality are larger, length 6.2, diam. 3, aperture 3 mm., with nearly 6 whorls.

There is a distinctly perforate or narrowly umbilicate form of *L. pallida*. A well-grown specimen in the Adams collection, pl. 43, fig. 43, measures, length 7, diam. 3.3, aperture 3 mm., with 6⅓ whorls. It is narrowly umbilicate, turrite-ovate, whitish-corneous with straightly conic spire. The surface is striatulate, the striæ very fine, but rather sharp and arcuate below the suture. Aperture somewhat oblique. Columella dilated, only obscurely truncate. The outer lip is slightly arched forward above. The sides of the spire diverge at an angle of 34 degrees in the example figured.

This form is similar to typical *monodon* in structure of the axis, while typical *pallida* resembles the so-called "variety" *opalescens*.

Haitian Form (pl. 43, fig. 51). At Cape Haitian two specimens were taken by Mr. Henderson of a *Leptinaria* not distinguishable from the Jamaican *L. pallida*. One is imperforate and only half-grown. The other, fig. 51, is quite openly umbilicate and measures, length 6, diam. 3, aperture 3 mm., whorls 6¼. Another imperforate specimen was found at Port au Prince.

4. L. paludinoides (Orbigny). Pl. 40, figs. 18, 19.

Shell oval, conic, thin, diaphanous, smooth. Spire conic, a little obtuse at the summit, composed of 5 very swollen whorls separated by a deep suture, the last whorl occupying less than half the total length. Aperture oval; columella acute, projecting, twisted, and truncate at the end. Color uniform white. Length 3, diam. 1.5 mm. (*Orb.*).

Cuba, in the interior (Sagra). Havana, Matanzas and Santiago de Cuba, in very damp, dark places, under stones (Arango).

Achatina paludinoides d'Orb., Historia Fisica, Politica y Natural de la isla de Cuba, v, Moluscos, p. 90 (1845), pl. 11 bis, f. 13-15. French edition, p. 171.—Pfr., Malak. Bl., v, p. 185 (Santiago).—*Euspiraxis p.*, Arango, Fauna Mal. Cubana, p. 99.—*Spiraxis p.*, Pfr., Monogr., iv, 574; vi, 191; Malak. Bl., 1854, p. 202.—Crosse, Journ. de Conch., 1890, p. 248.—*Lamellaxis p.*, Strebel, Beitrag, v, p. 114.

"By its shape, conic and thin, this species approaches *A. unilamellata*, but it differs by lacking the projecting lamella, by the infinitely smaller size, and by the more swollen, less numerous, whorls of the spire" (*Orb.*).

Orbigny's type (pl. 40, fig. 18) was apparently a very young shell. This view was taken by Pfeiffer and the Cuban authors generally. It has been lost (see Pfr., Malak. Bl., v, p. 185). The species when adult, fig. 19, *varies from imperforate to distinctly perforate*, and is oblong-conic or turrite in form, milky-whitish, somewhat translucent, thin, finely, irregularly striate. Spire straightly conic. Whorls 6½, separated by a deeply impressed suture. The earlier whorls are quite convex, the last compressed or flattened above, sometimes with an impressed line in the compression, parallel to the suture; convex peripherally and beneath. Aperture somewhat oblique, ovate, the outer lip straightened above, slightly arched forward. Columella very short, straight or concave, broad, deeply truncate below.

Length 8, diam. 3.2, aperture 3 mm.

Length 8.6, diam. 3, aperture 3.1 mm.

It is more lengthened than *L. pallida* Ad. of Jamaica, or *L. salleana* of Haiti, but it is closely related to both. There is a stouter and a more slender form, as indicated by the measurements above, and noticed by Pfeiffer.

Bulimus paludinoides Anton, Verzeichniss, p. 42, no. 1534 (1839), is probably a *Paludestrina*.

5. L. striosa (C. B. Adams). Pl. 44, figs. 52, 53, 54.

Shell imperforate, turrite, shaped like *Subulina;* thin but

strong, corneous-white or brown-tinted. Surface shining, densely and finely sculptured with slightly arcuate striæ. Spire long, regularly tapering, the summit obtuse, smooth. Whorls 9, quite convex, the last two a little flattened in the middle, very convex below the suture. Suture deeply impressed. Aperture small, ovate, the outer lip arched forward a little above. Columella short, concave, strongly truncate below.

Length 10.5, diam. 3, aperture 2.8 mm., whorls 9.

Length 8.5, diam. 2.5, aperture 2.3 mm., whorls 8½.

Jamaica (C. B. Adams); Swift river (W. J. Fox); west of Port Antonio, Mandeville and Bogwalk (Henderson and Simpson). Varieties in Haiti and Cuba.

Achatina striosa C. B. Ad., Contrib. to Conch., no. 2, p. 26 (Oct., 1849); no. 9, p. 167.—Pfr., Monogr., iii, p. 502.—*Lamellaxis striosus* C. B. Ad., Strebel, Beitrag Mex. Land- und Süsswasser-Conch., v, p. 114, pl. 12, f. 13.

The description is from Adams' type lot at Amherst; figs. 52, 53 from shells compared with the types. Prof. Adams gives the length of his original specimens as 7, diam. 2.12 mm., whorls 8. It is a common and widely distributed species, with much the aspect of *Subulina*. Spherical white eggs may be seen in some individuals.

In some places it is much smaller; in a series of 19 from west of Port Antonio the largest are about 6 mm. long, with 7½ whorls (fig. 54). At Bogwalk and Mandeville they are equally small.

I am inclined to refer these examples to *L. abdita* Poey, which is very similar.

In Haiti *L. striosa* occurs in the north at Cape Haitian and environs, Charmette, Sans Souci (pl. 44, figs. 55, 61, 63) and La Ferriere, inland towards Dondon; at Thomaseau, St. Mark and Port au Prince (pl. 44, fig. 59) in the Cul-de-sac. The shells from the latter place closely resemble the small form of Jamaica and the Cuban *abdita*. Those from other Haitian localities are practically identical with typical Jamaican *striosa* to the eye, but if there is a difference it is that Haitian *striosa* have the spire a trifle more slender.

5*a*. Var. ABDITA (Poey). Pl. 44, figs. 57, 58.

Shell imperforate, turrite-subulate, the apex rather acute; delicately striate, rather glossy, whitish. Whorls 6, a little convex. Columella arcuate, obliquely truncate. Aperture oval-oblong, angular above; peristome simple, acute, the right margin outwardly somewhat produced, columellar having a truncation. Length 5.66, diam. 2, aperture 1.66 mm. long, nearly 1 mm. wide (*Poey*).

Cuba: Almendares (Gundlach, type loc.), and Marianao (Rhoads), both near Havana. Santiago (Gundlach).

Subulina abdita POEY, Memorias, ii, p. 29, pl. 2, f. 15, 16 (1857).—PFR., Malak. Bl., 1858, p. 10.—CROSSE, Journ. de Conch., 1890, p. 248.—*Achatina abdita* Poey, PFR., Monogr., iv, 618.

"Apex as in *S. goodalli;* related to *S. striosa* Ad., but more slender. *S. subulatoides* Orb., from the description and figure, appears to differ by being more striate, narrower, with a different aperture" (*Poey*).

Poey's poor original figure is copied, fig. 57. One of a large series from Marianao, near Havana, is figured, fig. 58. The shell is clear whitish-corneous, translucent, and smooth except for weak striæ. The outer lip bends forward a little near the upper insertion. The columella is concave above and obliquely truncate below, its base being a rather acute, spirally-entering lamella. Length 6, diam. 2.1, aperture 2 mm., whorls 7. Most of the specimens contain several large eggs, showing yellowish through the shell.

This form tapers slightly more than the small form of *L. striosa* from Jamaica and Haiti, but the difference is so slight that I have not much doubt of their identity. It would be quite impossible to separate the shells if they were mixed.

L. ROBERTSI Pilsbry, n. sp. Pl. 50, figs. 19, 20, 21.

Shell slender, turrite, imperforate, thin, whitish-corneous, smooth, very faintly traced growth-lines visible only when highly magnified; somewhat glossy. Summit obtuse, rounded. Whorls 6½, convex, the last one slightly less so. Aperture vertical, rhombic-ovate, the thin outer lip moderately arched

forward; columella vertical, calloused, obliquely truncate at the base. Parietal film very thin. Length 4.9, diam. 1.3 mm.

Jamaica, probably in the western end, in company with *Spiraxis terebella conferta.*

This diminutive form was first noticed in the Adams collection at Amherst, where there are two specimens (figs. 19, 20) with the type of *Spiraxis terebella.* The larger of these is 4.3 mm. long with fully 6 whorls. Two larger shells were subsequently found in the collection of the Academy, one of which is made the type of the species (fig. 21). It is remarkable for the smoothness of the surface, the narrow contour and weak truncation of the columella. It has somewhat the aspect of *Obeliscus swiftianus.* Named in honor of Mr. S. Raymond Roberts.

L. ACICULARIS (Shuttleworth).

Shell acuminate-subulate, thin, smooth, glossy, waxen. Whorls 8, slightly convex, the last scarcely one-fifth the total length, base abruptly rounded; suture profound, whitish-crenulate. Aperture ,ovate-oblong, the base well rounded, truncate above. Columella subarcuate, intorted, obliquely calloused and truncate within at the base. Length 9, diam. 2.25, aperture 1.5 x 1 mm. (*Shuttl.*).

Porto Rico: Fajardo; a single specimen taken by Blauner.

Stenogyra (*Subulina*) *acicularis* SHUTTL., Diagnosen n. Moll., no. 6, p. 141, in Mittheil naturforsch. Ges. Bern, 1854, p. 49.—*Achatina a.*, PFR., Monogr., iv, 614.

This form remains unknown to later collectors. It probably stands close to *Leptinaria abdita, gracilis*, etc. I have not seen specimens.

6. L. GRACILIS n. sp. Pl. 44, fig. 66.

Shell imperforate, very slender, whitish-corneous, subopaque; surface rather glossy, finely striatulate, almost smooth. The spire tapers straightly to the small summit. Whorls 9½, strongly convex, the convexity greatest below the deeply impressed sutures. Aperture subvertical, the outer lip arched slightly forward. Columella concave above, callous and obliquely truncate below. Length 9, diam. 2.2, length of aperture 2.2 mm.

Haiti: Port-au-Prince and 8 miles westward (Henderson and Simpson).

This species is related to *L. striosa* C. B. Ad., but it is far more slender with a smaller apex, and with more whorls in shells of the same length. Most of the specimens taken were smaller than the above dimensions, 7 mm. long with 8 whorls.

7. L. SALLEANA (Pfeiffer). Pl. 44, figs. 60, 64, 65.

Shell subperforate, conic-oblong, thin, striatulate, slightly shining, waxy-whitish. Spire turrite, the apex rather acute. Suture lightly impressed, simple. Whorls 6, flattened, the last slightly exceeding one-third the total length. Columella short, truncate, twisted inward. Aperture oblong-semioval; peristome simple, unexpanded, the columellar margin duplicate-reflexed, forming a perforation. Length 7, diam. 3, aperture scarcely 3 mm. long, 1 wide (*Pfr.*).

Haiti: near the city of Santo Domingo (Sallé, H. Prime); Rio Ozama (H. Prime).

Achatina salleana PFR., Zeitschr. f. Malak., 1850, p. 74; Conchyl. Cab., *Bulimus*, p. 309, pl. 24, f. 14, 15.—*Spiraxis salleana* PFR., Monogr., iii, p. 472; iv, 575; vi, 193.—CROSSE, Journ. de Conch., 1891, p. 151.—*Lamellaxis salleanus* Pfr., STREBEL, Beitrag, v, p. 112, pl. 7, f. 8; pl. 17, f. 4.

"Very like *A. anomala* Pfr., from which it chiefly differs by the flat whorls and narrow aperture" (*Pfr.*). Pfeiffer's figure of the type is copied, fig. 60. When fully adult (figs. 64, 65) the shell is larger, length 8.3, diam. 3.7, aperture 3.1 mm., with fully 7 whorls, or a little narrower, 8 x 3.3 mm. The whorls in a large lot of specimens before me are not especially flattened, and the suture is more deeply impressed than would appear from Pfeiffer's description. The surface is distinctly arcuately striate, and the perforation is usually well open, though rarely closed in the narrower shells. The columella has a stout tooth-like callus superposed upon the inner edge of an *Opeas*-like reflexed margin. Within the last whorl a stout callous fold revolves very obliquely around the column, but in earlier whorls the axis is slender and only very weakly sinuous.

It is related to *L. paludinoides* Orb. of Cuba, but that is slightly more lengthened with flatter whorls.

7*a*. Var. HAITENSIS n. v. Pl. 46, fig. 10.

The shell is smaller but with as many whorls as *salleana*. Whorls somewhat more convex, the last swollen. Outer lip arched forward more strongly above than in *salleana*. Length 6.2, diam. 3, aperture 2.7 mm., whorls 7.

Cape Haitian (J. B. Henderson).

8. L. SIMPLEX (Guppy). Pl. 40, fig. 14.

"Shell cylindric-turrite, longitudinally sinuate-plicate, buff, covered with a straw-colored cuticle; whorls 8 to 9, slightly convex, the last exceeding the length of the spire; suture incised. Aperture ovate-oblong; columella strongly twisted or somewhat reflexed, truncate; peristome simple, a little projecting above and in the middle.

"Length 14, diam. 4, height of aperture 4.5 mm.

"Length 12, diam. 5, height of aperture 5 mm.

"Length 15, diam. 6, height of aperture 4.5 mm.

"Var. *a*, columella strongly twisted, broadly and obliquely truncate; aperture much dilated anteriorly.

"Var. *b*, larger, rimate; columella reflexed, scarcely truncate (*Guppy*)."

Trinidad (Guppy); Oropouche, Trinidad (Ponsonby).

Spiraxis simplex GUPPY, Annals and Mag. Nat. Hist., 4 ser., i, p. 438 (June, 1868).—PFR., Monogr., viii, p. 257.—CROSSE, Journ. de Conch., 1890, p. 37.—GUPPY, Journ. of Conch., vii, p. 212.—*Subulina* (*Nothus*) *simplex* Guppy, SMITH, Journ. of Conch., viii, p. 235, pl. 8, f. 1 (1896).—*Tornatellina costellosa* GUPPY, Proc. Scient. Asso. Trinidad, 1869, p. 243; *cf.* Revised List of the Land and Freshwater Molluska of Trinidad, p. 6, in Proc. Sci. Asso. Trinidad, 1872.

A species not unlike *L. paludinoides* and *L. salleana*. In his revised list of 1872 Mr. Guppy states that "*Tornatellina costellosa* was described from an immature form of this shell." I have not seen the species, and copy Mr. Smith's figure.

9. S. URICHI Smith. Pl. 40, fig. 13.

Shell elongate, turrite, narrow, rimate, pale, pellucid,

glossy, sculptured with delicate, oblique, arcuate growth-striæ. Whorls 8, moderately convex, crenulate at the suture; spire produced, somewhat obtuse at the apex. Aperture small, inversely auriform, nearly one-fourth the total length; lip very thin, obliquely arcuate; columella rather straightened, narrowly reflexed above, subtruncate or plicate below the middle. Length 10.5, diam. 3, aperture nearly 3 mm. long (*Smith*).

Trinidad: Oropouche (Urich in coll. J. H. Ponsonby).

Subulina (*Nothus*) *urichi* E. A. Smith, Journal of Conchology, viii, July, 1896, p. 235, pl. 8, f. 2.

"Rather larger than *Opeas micra*, more glossy, and with a plicate or subtruncate columella. Smaller and more slender than *S. simplex*, also with finer lines of growth" (*Smith*). The figure shows no truncation of the columella, and looks more like an *Opeas*. In some other species also the truncation is very weak.

South American Species.

L. lamellata (species no. 1) is widely spread in South America. The others now known are, with the exception of *L. perforata*, more slender and lengthened forms with no parietal lamella. Their number will probably be greatly increased when the country is searched for small shells.

10. L. perforata (Pfeiffer).

Shell perforate, ovate-turrite, arcuate-striate, thin, whitish-hyaline. Spire elongate, the apex acute. Whorls 7, convex, distantly plicatulate at the sutures, the last whorl slightly more than one-third the total length. Parietal lamella minute. Aperture slightly oblique, sinuate-oval, acuminate; columella with a twisted lamina; peristome thin, the right margin unexpanded, arched forward above; basal margin expanded; columellar margin reflexed. Length 18, diam. 7.5, aperture 7 x 3.5 mm. (*Pfr.*).

Venezuela (Pfr.).

Tornatellina perforata Pfr., Proc. Zool. Soc. Lond., 1856, p. 336; Monographia, iv, p. 653.—*Leptinaria* (?) *perforata* Pfr., Nomencl. Hel. Viv., 1878, p. 336.

An unfigured species, larger than any other except *L. hel-*

enæ, and apparently resembling *L. lamellata* in surface and aperture.

11. L. ANOMALA (Pfeiffer). Pl. 46, fig. 9.

Shell subperforate, oblong-conic, thin, very delicately striate, pellucid, glossy, waxy-hyaline. Whorls 6½, convex, the last about two-fifths the total length. Columella short, not reaching to the base, twisted inward and obliquely truncate. Aperture semioval; peristome unexpanded, simple, the right margin curved forward a little in the middle; columellar margin duplicated, reflexed, leaving an umbilical perforation.

Length 9.5, diam. 4, aperture 3.66 x 2 mm. (*Pfr.*).

Peru (Pfr. coll.).

Achatina anomala PFR., Symbolæ, iii, p. 89 (1846); Monogr., ii, p. 270; iii, 472; iv, 575; vi, 193; Conchyl. Cab., p. 309, pl. 24, f. 16, 17; and in Philippi, Abbild. u. Beschreib., etc., ii, p. 214, pl. 1, f. 12.—Not *Opeas anomalus* Pfr., STREBEL, Beitrag, v, p. 107, 108.

I have not seen this species. Pfeiffer notes that the columellar margin of the aperture is twisted and truncate inwardly, but outwardly it is reflexed, forming a false umbilicus. The shell is rather strong but quite thin, translucent, clear wax-colored and finely striate.

12. L. AEQUATORIA (Miller). Pl. 46, fig. 5.

Shell perforate, ovate-conic, thin, glassy, smooth, arcuate-striate under the lens, glossy. Spire convexly conic, the apex subacute. Whorls 8, convex, separated by a deep suture, the last nearly one-third the total length. Columella twisted, provided with an obliquely entering fold in the middle, arcuately passing into the peristome. Aperture not oblique, suboval. Peristome simple, acute, the right margin curving forward in the middle, basal margin a little receding, columellar margin dilated, adnate above, the margins generally joined by a white callus. Length 14, diam. 5, aperture 4.66 x 3 mm. (*Miller*).

Ecuador: Guayaquil, in damp places, abundant (Wolf).

Spiraxis aequatoria MILL., Malak. Blätter n. F., i, p. 127, pl. 13, f. 6 (1879).—*Lamellaxis aequatorius* Mill., STREBEL, Beitrag Mex., etc., v, p. 113, pl. 17, f. 1.

Miller states that white eggs 1 mm. in diam. were contained in many of the shells. Strebel figures a shell of the original lot (pl. 46, fig. 5) measuring 13.1 x 5 mm., whorls 7¼. He gives measurements of others, the smallest 7.6 x 3.1 mm., with nearly 5¾ whorls. The species needs comparison with *L. anomala* Pfr., with which it may prove to be identical.

13. L. RITCHIEI n. sp. Pl. 46, fig. 12.

Shell perforate, ovate-turrite, thin, pale greenish-buff, opaque. Surface slightly shining, densely sculptured with close, sharp, somewhat arcuate striæ, the first 1½ whorls smooth. Spire regularly tapering to the obtuse apex. Whorls 5½, convex, parted by a deep suture. Aperture subvertical; outer lip acute and thin, slightly arched forward above. Columellar margin reflexed. Columella straight above, weakly, obliquely truncate near the base. Length 7.6, diam. 3.3, aperture 3 mm.

Ituchy, on the Purus River. Co-types in coll. A. N. S. P. and J. Ritchie, Jr.

This peculiar shell has so weak a truncation that it might almost be referred to *Opeas*. In an oblique view in the mouth the basal excavation of the columella appears stronger than in the front view. It is further distinguished by its close and sharp striation. The specimens are from the collection of J. Ritchie, Jr., of Boston.

14. L. INTERMEDIA n. sp. Pl. 40, fig. 12.

Shell perforate, oblong-turrite, thin, corneous with some scattered yellowish dots. Surface glossy, nearly smooth, with slightly arcuate growth-wrinkles only. Spire rather wide, its outlines convex, summit rather obtuse. Whorls 6½, convex, slowly increasing, separated by deeply impressed sutures. Aperture small, subvertical; outer lip thin, arching slightly forward. Columellar margin reflexed, nearly closing the perforation; columella straight above, very obliquely excised but hardly truncate below. Length 9.7, diam. 3.8, length of aperture 3.1 mm.

Venezuela (Ralph Tate).

This form stands between *Opeas* and *Leptinaria*. The

slight obliquity of the columella near the base has served to give it place in the latter genus, whether fairly or not I am in doubt.

15. L. VENEZUELENSIS (Pfeiffer).

Shell subperforate, turrite-oblong, thin, striatulate, diaphanous, waxy-whitish. Spire elongate, the apex rather obtuse. Whorls 7, convex, the last one-third the total length, rounded basally. Columella slightly twisted, subtruncate. Aperture slightly oblique, oval-oblong; peristome simple, unexpanded, the columellar margin dilated above, reflexed, subpatulous. Length 11, diam. 4, aperture 4 x 2.25 mm. (*Pfr.*).

Venezuela: Caracas (E. Klocke).

Spiraxis venezuelensis PFR., Malak. Blätter, iii, 1856, p. 47; Monogr., iv, 574.

This species has not been figured.

16. L. PACHYSPIRA n. sp. Pl. 46, figs. 8, 11.

Shell perforate, oblong-conic, thin, greenish-yellow, surface glossy, finely sculptured with very fine, close, nearly regular vertical striæ, wanting on the smooth 1½ apical whorls and weaker on the base. Spire straightly tapering to the *very large, obtuse summit.* Whorls 6, moderately convex, narrow, parted by a well-impressed suture, the last whorl swollen. Aperture vertical; outer lip slightly arched forward, thin; columellar lip broadly reflexed above. Columella vertical, with a rather acute, obliquely-entering lamella near the base. Parietal wall covered with a very thin, transparent film.

Length 9.3, diam. 4.6, aperture 4 mm.

Length 9.4, diam. 4, aperture 3.9 mm.

San Estevan, Porto Cabello, Venezuela (C. F. Starke, 1863, in Swift coll.).

This species is unlike other known forms in its very large, obtuse summit and the acute lamella encircling the columella near its base.

Species of Mexico and Central America.

The numerous species are for the most part not very distinctly differentiated, and their number will probably be re-

duced when good series are available for comparison. *Spiraxis dubia* Pfr. may, von Martens suggests, belong to *Leptinaria*, but it seems more nearly related to the *Oleacinidæ*.

No parietal lamella at any stage of growth, species 16 to 35.

A parietal lamella developed at least in the young, species 36 to 40.

L. imperforata, no. 33, seems to be related to the long Antillean and South American species, rather than to those of Mexico.

17. L. TAMAULIPENSIS Pilsbry. Pl. 50, fig. 26.

Shell openly perforate, ovate-conic, pale yellowish-corneous. Surface glossy, finely and closely, irregularly and weakly striatulate, and showing very indistinct traces of spaced riblets parallel to growth lines. Spire straightly conic, the apex quite obtuse. Whorls 5½, convex. Aperture less than half the total length. Columella vertical, broadly reflexed above, tapering downwards, obliquely subtruncate and having a low fold slightly below the middle. No parietal lamella. Length 7, diam. 3.7 mm., aperture 3 mm. long.

The young shells of 2.5 mm. length have a relatively stronger columellar lamella than adults, but no parietal armature.

Mexico: Tamaulipas, in a cañon about 4 miles west of Victoria, elevation about 3,000 feet (Rhoads). Types 85,909, A. N. S. P.

L. tamaulipensis PILS., Proc. A. N. S. Phila., 1903, p. 776, pl. 50, f. 8.

This species is related to *L. mexicana* and *L. martensi*, but differs from both in wanting spaced riblets, though faint traces of them persist, at least in some specimens. They are represented much too strongly in the figure. No other *Leptinaria* has been reported from north of Misantla, Vera Cruz.

18. L. MEXICANA (Pfr.). Pl. 41, figs. 2, 3, 4, 5.

Shell subperforate, ovate-turrite, rather thin, whitish-hyaline; sculptured with rather distant, fine plicæ. Spire elevated, the apex obtuse. Whorls 7, convex, the last about two-fifths the total length, rounded basally. Columella rather

wide, dentate-twisted. Aperture slightly oblique, sinuate-oblong; peristome simple, unexpanded, the right margin somewhat curved forward, columellar margin dilated, somewhat appressed. Length of largest specimen 9, diam. 4, aperture 3.66 x 2 mm. (*Pfr.*).

Mexico: State of Vera Cruz at Mirador (type loc., Berendt), Misantla and neighboring places and Canada de Coatepec near Jalapa (Strebel); Texolo (S. N. Rhoads).

Spiraxis mexicana Pfr., Malak. Bl., xiii, 1866, p. 84; Monogr., vi, 194.—Crosse & Fischer, Miss. Sci. Mex., Moll., i, p. 617.—*Lamellaxis m.*, Strebel, Beitrag, v, p. 109, pl. 7, f. 14, pl. 17, f. 3, 6 *b*, *d*, 7 *a*, 38.—*Leptinaria m.*, Marts., Biologia, p. 316, with var. *turrita* and *abbreviata*.

Strebel, who examined and figured Pfeiffer's type (pl. 41, fig. 2) states that there were two species mixed in the original lot, part being referable to *modestus* Strebel. The sculpture consists of an extremely fine fold-striation and fine, somewhat arcuate riblets, standing not very regularly and not very closely, sometimes widely spaced, becoming weaker and wholly or almost disappearing towards the lower half of the whorl, especially on the last whorl. The whorls are rather convex, and weakly terraced at the deep sutures. The umbilicus is narrow.

Strebel found a narrower and a wider form of the species, sometimes occurring together, but more often in separate colonies. The narrower form (fig. 4) measures about 9 to 9.66 x 3.3 to 3.5 mm., aperture 3 to 3.2. It has been named var. *turrita* Martens, but seems, as Strebel held, not distinguishable from typical *mexicana*.

Var. *abbreviata* Martens, pl. 41, fig. 5. Wider; length 7.7, diam. 3.6 mm., with 6¼ whorls. This is Form B of Strebel. The specimens taken by Rhoads at Texolo agree best with this form.

Var. *utilensis* nov. Pl. 41, figs. 9, 10.

Specimens collected by Mr. C. T. Simpson at Utila Island, Honduras, have the first 2¼ whorls smooth, the next 2 or 3 sculptured with well-spaced, thread-like riblets, and the last

1 or 1½ whorls more finely rib-striate, the riblets persisting on the last whorl to the lip, but obsolete on periphery and base. The axis is imperforate or with a very small chink. Apex smaller than in *mexicana* from Texolo, V. C. Whorls 6.

Length 8, diam. 3.9, aperture 3.3 mm.

Length 8, diam. 3.4, aperture 3.3 mm.

19. L. MARTENSI (Pfeiffer). Pl. 41, figs. 6, 8.

Shell subperforate, turrite-oblong, thin, striatulate and distantly thread-costate, diaphanous, whitish-hyaline; spire turrite, rather obtuse; whorls 6, convex, the last scarcely two-fifths the length, rounded. Columella subdentate-plicate in the middle. Aperture slightly oblique, elliptical-oval; peristome simple, unexpanded, the columellar margin widely reflexed, partly free. Length 9.33, diam. 4.5, aperture 4 x 2.33 mm. (*Pfr.*).

Mexico: State of Vera Cruz at Cordova (type loc., Sallé); Mirador (Strebel); about 500 ft. above town of Orizaba (Heilprin); Antigua (S. N. Rhoads).

Bulimus martensi PFR., P. Z. S., 1856, p. 318; Monogr., iv, p. 451.—*Spiraxis m.*, CROSSE & FISCH., Miss. Sci. Mex., Moll., i, p. 619, pl. 25, f. 9.—*Leptinaria m.*, MARTENS, Biologia, p. 316, with var. *inflata* (1898).—*Lamellaxis modestus* STREBEL, Beitrag, v, p. 111, pl. 7, f. 15, pl. 17, f. 5*a*, *b*, 6*a*, 7*b*, 31.

The spire is not so high as in *L. mexicana*, the whorls increase more rapidly, and the shell appears more ventricose. The columellar axis is wider than in *mexicana*, hollow, and not twisted except in the last whorl, so that the spiral fold of the columella is less sharply lamellar than in *mexicana*.

Var. *modesta* Strebel, pl. 41, fig. 7, is more ventricose, with the coarser folds very weak and more separated; length 7.6, diam. 3.4, to length 8.2, diam. 3.5 mm. Misantla. This is *L. modestus form A.* of Strebel, and var. *inflata* of Martens.

20. L. PITTIERI Martens. Pl. 41, fig. 13.

Shell conoid-ovate, with papillar apex, perforate, thin, subpellucid, evenly finely striate, gray-whitish or yellowish-whitish. Whorls 6 to 6½, rather flattened, suture quite im-

pressed, subgradate, the last well rounded basally. Aperture subvertical, trapezoidal-piriform, the outer margin slightly arcuate above, a little arched forward, basal margin broadly rounded; columellar margin subvertical, wide, abruptly tapering near the base, encircled with a distinct, lamelliform spiral fold. Parietal wall covered with a very thin callus (*Marts.*).

Length 10.5, diam. 8, aperture 5.5 x 3 mm.

Length 9.5, diam. 6, aperture 5 x 3 mm.

Length 8.5, diam. 5, aperture 4 x 2.5 mm.

Costa Rica: La Palma, San Francisco de Guadalupe, La Uruca, San José, Santa Clara, Alajuelita, near Talamanca, and middle course of the Rio Pacuare del Sur (Biolly and Pittier).

L. pittieri Martens, Biologia, pp. 317, 639, pl. 18, f. 7 (1898), with var. *obliquata* Marts., l. c., pl. 18, f. 8.

Width of the perforation somewhat variable. In the specimen from Santa Clara are six calcareous white eggs of globular form, 1.7 to 1.8 mm. in diameter (*Marts.*).

Var. *obliquata* Martens. Pl. 41, fig. 14. Differs by having the columellar margin obliquely produced downward and outward, with a dentiform fold. Length 10, diam. 6, aperture 5 x 3 mm. Last whorl, seen from the dorsal side, as 1 : 2. Central Costa Rica at Tarbaca.

21. L. hyalina (Tate).

"Related to *interstriata*, hyaline with a higher and more inflated body-whorl. Length .23, height of last whorl .12, breadth .15 inch. One specimen only was obtained with *Bulimus berendti*" (*Tate*).

Eastern Nicaragua: Toro Rapids, of the river San Juan (Tate).

Tornatellina hyalina Tate, Amer. Journ. of Conch., v, p. 157 (Feb. 3, 1870).—*Leptinaria h.*, Marts., Biologia, p. 317.

Not figured. "Perhaps identical with my *L. pittieri*" (*Marts.*).

22. L. exigua Martens. Pl. 42, fig. 30.

Shell ovate, perforate, thin, very lightly striatulate, rather glossy, pellucid, more or less variegated with white. Whorls

5, rather convex, suture compressed, the upper whorls distinctly costulate, the last whorl well rounded at the base. Aperture moderately oblique, trapezoidal-piriform, the outer margin moderately arcuate, not arched forward, basal margin rather narrowly rounded; columellar margin broadly dilated above, narrowed towards the base, slightly twisted; parietal wall without callus. Length 5, diam. 3, aperture 3 x 2 mm. (*Marts.*).

Mexico: Teapa, Tabasco (H. H. Smith).

L. exigua Marts., Biologia, p. 318, pl. 18, f. 10 (1898). "Distinct from *L. guatemalensis* Cr. & Fisch., and from *L. martensi* var. *inflata*, by the want of costæ on the last whorl and by the size. Both the sculpture and the columellar fold are very feebly developed, but the general appearance of the shell is that of a true *Leptinaria*. The two specimens seen are of equal size. The whorl before the last in one of them is distinctly costate, in the other with obsolete costæ. Both shells have somewhat the aspect of not being full-grown, but I know no other species to which they could be attributed as a young state" (*von Martens*).

23. L. interstriata (Tate). Pl. 41, fig. 12.

Shell openly perforate, ovate-conic, thin; sculptured with slender, well-spaced, slightly arcuate riblets, which disappear at the periphery of the last whorl and are wanting on the initial 2¼ whorls; the intervals weakly striatulate. Whitish-corneous (but no quite fresh shells were taken). Spire straightly conic, the summit obtuse; whorls 6½, strongly convex, parted by a deep suture, the base of the last whorl quite convex. Aperture ovate, scarcely oblique, the outer lip evenly arcuate, very little arched forward. Columellar margin widely dilated above, rapidly tapering downward, bearing a very strong, obtuse, spiral lamella near its base, concave and oblique above the lamella. No parietal lamella.

Length 7.5, diam. 3.5 mm., aperture 3 mm. (co-type).

Length 9.37, diam. 4.37 mm., whorls 7 to 8 (*Tate*, co-type).

Panama: On an island in the lagoon of Boca del Toro (Tate). Costa Rica: Plains of the Rio Grande of Terraba (Pittier).

Tornatellina interstriata TATE, Amer. Journ. of Conch., v, p. 957, pl. 16, f. 5 (1870).—PFR., Monogr., viii, p. 259.—*Leptinaria i.*, ANGAS, P. Z. S., 1879, p. 485.—MARTENS, Biologia, p. 318.

This species, described and figured from a co-type, is closely related to *L. mexicana*, but the columellar lamella is much more strongly developed.

24. L. CRENULATA Martens. Pl. 41, fig. 21.

Shell acutely ovate, rimate-perforate, rather solid, sculptured with rather distant, submembranous riblets, vanishing on the last whorl, and fine interstitial striæ; yellowish-white, rather glossy. Whorls 6, somewhat flat, the *suture bordered by an angle* and *finely* crenulated, the last whorl rather swollen basally. Aperture a little oblique, ovate, the outer margin slightly arched forward, the basal rather broadly rounded; lower third of the columellar margin thin, vertically ascending; its upper two-thirds wide, a little concave and encircled with a thin, distinct, spiral fold, not toothed. Parietal wall covered with a thin callus, emarginate above. Length 11, diam. 6, aperture 5 x 3 mm. (*Marts.*).

Costa Rica: Uren, near Talamanca (Pittier).

L. crenulata MARTS., Biologia, p. 318, 639, pl. 18, f. 12 (1898).

"The angular line bordering the suture is distinctly visible when the shell is viewed in certain positions, but in others it appears only as a sudden change in the convexity; it is more distinct in the last whorl. The crenulation or indentation of the suture is rather faint. I have seen only one specimen, which shows, at some distance behind the aperture, two slightly thickened and more darkly colored interruptions of growth (varices), proving that it is a full-grown individual" (*v. Mts.*).

25. L. SINISTRA Martens. Pl. 42, fig. 32.

Shell conoidal, openly perforate, vertically striatulate, pale gray-yellowish, diaphanous, thin. Whorls 6, a little convex, the last rounded, base convex, smooth. Aperture vertical, rhombic, the outer margin a little convex, basal margin

ascending outwardly, columellar margin a little oblique, lightly dilated and reflexed above, obsoletely toothed in the middle. Length 4, diam. 2, aperture 1.5 x 3 mm. (*Marts.*).

Nicaragua: Acoyapa, on the north side of Lake Nicaragua (Belt).

L. sinistra MARTS., Biologia, p. 319, pl. 18, f. 11.

Distinct from all others of the genus by the sinistral whorls. Only one specimen was found. The quadrangular form of the aperture and the very feeble development of the columellar tooth are perhaps due to the shell not being full-grown (*Marts.*).

26. L. GUATEMALENSIS (Crosse et Fischer). Pl. 41, fig. 11.

Shell subperforate, ovate-turrite, rather thin, subdiaphanous, longitudinally plicate-costulate, whitish, somewhat elevated, the apex obtuse, suture impressed. Whorls 6, convex, the last about two-fifths the total length, rounded and a little smoother at base, the plicæ passing into striæ. Aperture slightly oblique, sinuate-oblong; peristome simple, thin, unexpanded, the columellar margin rather wide, lightly dentate-twisted, white, outer lip curving forward a little, acute. Length 5.5, diam. 2.5, aperture 2 x 1.25 mm. (*C. et F.*).

Guatemala: Coban (Sarg, type loc.); Retalhuleu, in a wood under decayed leaves (Stoll).

Spiraxis guatemalensis C. & F., Journ. de Conch., xxv, 1877, p. 271; Miss. Sci. Mex., Moll., i, p. 618, pl. 25, f. 10.—*Leptinaria g.*, MARTENS, Biologia, p. 319, with var. *majuscula*, pl. 18, f. 13.

"This form is very closely related to *S. mexicanus* Pfr., but it is distinguished by its slightly smaller size, the stronger, more crowded and more arcuate longitudinal riblets, which extend wholly across the whorls of the spire, and on the last whorl change gradually into striæ instead of disappearing abruptly in the middle" (*C. et F.*). It is somewhat smaller than *L. interstriata* Tate, with a weaker columellar lamella.

Var. *majuscula* Martens. Pl. 41, fig. 15.

Larger, and with a stronger columellar fold. Length 7 to 7.5, diam. 3 to 3.5, aperture 2.66 to 3.5 x 2 mm. (*Marts.*).

Costa Rica: Guanacaste, San José, valley of the Rio Terraba and Golfo Dulce (Pittier).

27. L. FILICOSTATA (Strebel). Pl. 41, figs. 16, 17.

Shell similar in shape to *L. mexicanus*, though the whorls are less convex, but differing from all other species by the close, fine, sharp riblets which as usual weaken on the lower half of the whorl. The columellar reflection is rather wide and stands out, leaving an umbilical perforation. The columellar fold is like that of *L. modestus*, rather weakly developed and inflated rather than lamelliform.

Length 8, diam. 3, aperture 2.7 x 1.5 mm., whorls 6¾.

Length 7.2, diam. 2.9, aperture 2.7 x 1.4 mm., whorls 6⅛.

Guatemala: San Miguel Jucume (probably S. Miguel Turucu in the Polochic valley) (Starck). Honduras: Copan, near the Guatemalan frontier (v. Ihering).

Lamellaxis filicostatus STREBEL, Beitrag Mex., v, p. 113, pl. 17, f. 10 (1882).—*Leptinaria f.*, MARTS., Biologia, p. 319.

"Very easily distinguished from all other species by the sculpture."

28. L. STREBELIANA n. sp. Pl. 42, fig. 25.

Shell perforate, oblong-turrite, thin, sculptured with very irregularly-spaced, slightly arcuate, thread-like riblets, which become obsolete near the lower suture on the spire and at the periphery of the last whorl. Spire long, the summit very obtusely rounded. Whorls 6½, the first 2¼ smooth, moderately convex, the rest very convex and separated by deeply impressed sutures. Aperture small, irregularly ovate, the outer lip slightly arched forward, basal margin broadly rounded, hardly receding. Columella vertical, broadly reflexed, obliquely deeply truncate near the base. Length 8.1, diam. 3, aperture 2.8 mm.

Nicaragua: Polvon (McNiel).

Slenderest and most *Opeas*-like of the Central American species, and further notable for its very convex whorls, sculptured with raised, thread-like riblets, which are more crowded than in *L. mexicana*, and unevenly spaced. It stands close to *L. filicostata*, but differs by its very convex whorls. No fresh

specimens showing the color are known, but it is probably yellowish-corneous or white in life.

29. L. SIMPSONI (Ancey). Pl. 42, fig. 23.

Shell imperforate, thin, somewhat pellucid, nearly colorless, glossy, subarcuately striatulate; spire regularly conic, elongate, quite obtuse at the apex. Whorls 6½, regularly and rather slowly increasing, a little convex, parted by a well-impressed suture, the penultimate a little flattened in the middle, last whorl ample, inflated and convex past the middle, regularly descending. Columella thin, long, strongly twisted and truncate near the base, forming a wide, obtuse tubercle; narrowly reflexed and thickened over the umbilical region. Aperture nearly piriform, subeffuse at base; peristome simple, acute, not in the least thickened or reflexed, the outer margin produced forward, sinuated at the upper insertion, basal margin receding, well rounded within. Length 9, diam. 4.25, aperture 3.5 x 2 mm. (*Anc.*).

Honduras: Utila Island (C. T. Simpson).

Nothus simpsoni ANC., Annales de Malacologie, ii, p. 245 (1886).

"Remarkable for the long cone of the spire, obtuse at the summit, the absence of a perforation, and the spreading base of the aperture" (*Anc.*). Specimens of the original lot received from Mr. Simpson are not full-grown, the one figured measuring, length 7, diam. 2.8, aperture 2.7 mm., with 5¾ whorls. The surface is very finely and sharply arcuately striate, without any trace of spaced riblets. The base is somewhat smoother.

30. L. FORDIANA (Ancey). Pl. 42, fig. 24.

Shell subturrite-oval, of the same color and luster as *simpsoni*, imperforate, under the lens arcuately obsoletely striatulate except at the apex and base. Spire scarcely longer than the aperture, regularly conoid and tapering, obtuse at the summit. Whorls 5½, regularly increasing, convex, parted by an impressed suture, the first two smooth, the last whorl large, nearly as long as the spire, somewhat inflated, very convex, smoother below the middle. Aperture irregularly

subpiriform, but slightly oblique, subeffuse at base; outer margin sinuous, slightly receding at the upper angle and at base; columellar margin thickened, straight, strongly twisted inward, with a very oblique but slight truncation; peristome simple and acute. Length 6.75, diam. 3.66, aperture 3.33 x 1.75 mm. (*Anc.*).

Honduras: Island of Utila (C. T. Simpson).

Nothus fordianus Anc., Ann. de Malac., ii, p. 248 (1886).

This Nothus is dedicated to Mr. John Ford of the Academy of Philadelphia. It is most nearly related to *N. simpsoni*. It is imperforate like that, but is smaller, of narrower, more ovate form, the spire less long conic, last whorl higher, as long as the spire and more regularly rounded; the summit is less obtusely rounded; the width of the shell is greater. It resembles certain *Leptinaria* in contour and general characters excepting the parietal lamella, especially *L. antillarum* Shuttl. of Guadeloupe (*Anc.*).

My figure is drawn from one of the original lot, the individual measuring, length 7.3, diam. 3.6, aperture 3 mm., with 6 whorls. One shell before me is a little larger, with less abruptly truncate columella. The fine, arcuate striation is very similar to that of *L. simpsoni*, which is very closely related. In some shells there is a minute chink behind the columellar lip.

31. L. yucatanensis n. sp. Pl. 42, figs. 27, 29.

Shell openly perforate, acutely ovate-conic, whitish-corneous, brown-tinted towards the summit; irregularly, somewhat coarsely striatulate, moderately glossy. Spire straightly conic, the apex rather small. Whorls 6½, convex, the first 2½ smooth; last whorl very convex basally, but scarcely smoother there. Aperture ovate, hardly oblique; outer lip very slightly arched forward. Columellar lip dilated and built forward above, leaving a widely open umbilical perforation, very obliquely truncate at base, and bearing a weak, obliquely entering fold. Parietal callus very thin. Length 6.6, diam. 2.9, aperture 2.4 mm.

Yucatan: Labna (Heilprin exped., 1890).

The surface is somewhat smoother than in *L. simpsoni.* There is no trace of spaced riblets. The columella in oblique view (fig. 29) is seen to be very wide and distinctly truncate, and the umbilical fissure is more ample than in any other Mexican or Central American species I have seen.

32. L. BIOLLEYI Martens. Pl. 41, fig. 18.

Shell oblong-conoid, rimate, thin, lightly costulate, yellowish or whitish, diaphanous. Whorls 6, a little convex, the suture moderately impressed, last whorl moderately rounded basally. Aperture subvertical, obliquely piriform, the outer margin regularly arcuate, forwardly convex, basal margin narrowly rounded, columellar margin vertical, very obliquely truncate and encircled with a thin, slender lamella. Parietal wall unarmed. Length 6 to 7, diam. 3, aperture 3 x 2 mm. (*Marts.*).

Costa Rica: near San José, among moss (Biolley); Talamanca (Pittier).

L. biolleyi MARTS., Biologia, p. 319, pl. 18, f. 14 (June, 1898).

Allied to *L. salleana* Pfr. from Haiti, but with more feeble columellar margin (*Marts.*).

33. L. COSTARICANA Martens. Pl. 41, fig. 19.

Shell ovate-oblong, subturrite, rimate, rather solid, striatulate, glossy, pale yellowish. Whorls 6 to 7, a little convex, regularly increasing, the suture moderately impressed, subgradate, the last gradually tapering basally. Aperture a little oblique, trapezoidal, the outer margin rather straight, basal broadly rounded, columellar margin obliquely truncate, vertically ascending, encircled with a narrow spiral lamella. Parietal wall unarmed (*Marts.*).

Length 9, diam. 4, aperture 3 to 4 mm.

Length 6 to 7, diam 3, aperture 3 mm.

Costa Rica: San José, Terraba, El Pital in the Rio Naranjo valley, plain of Rio Corredor, in the Golfo Dulce region, Quebrada de Java and springs of Djiri Durunia, in the Rio Bras valley, and valley of Rio Diquis (Pittier).

L. costaricana MARTS., Biologia, p. 320, 639, pl. 18, f. 15 (June, 1898).

Allied to *L. mexicana*, but of larger size, with comparatively greater diameter of the last whorl and fainter striæ (*Marts.*).

34. L. IMPERFORATA (Strebel). Pl. 42, fig. 28.

Shell strong, translucent, whitish, rather narrowly turrite and moderately glossy. The sculpture consists of irregular but close, fine fold-striæ, between which, in the irregular, rather wide intervals there are fine ripple-folds, not very well expressed and only weakly arcuate. The whorls show, as usual, their greatest convexity near the suture, causing the latter to be deep. The right lip is simple, unexpanded, scarcely arched forward in the middle. The columellar reflection is narrow, and so closely appressed that no umbilical fissure is visible. The axial lamella is quite like that of *L. æquatorius*, only less strongly developed. No parietal callus is visible (*Strebel*).

Length 12.9, diam. 4.2, aperture 3.9 x 2.3 mm.; whorls fully 8.

Length 11.5, diam. 4.2, aperture 3.7 x 1.9 mm.; whorls 7⅛.

Length 11.2, diam. 3.7, aperture 3.7 x 1.8 mm.; whorls 7⅛.

Mexico: Jalapa, on a strawberry plant (Estefania Salas).

Lamellaxis imperforatus STREBEL, Beitrag Mex. Land- und Süsswasser-Conchylien, v, p. 113, pl. 7, f. 14*c*; pl. 17, f. 2 (1882).

This species differs from *L. æquatorius* by its more slender shape, greater number of whorls in specimens of the same size, the closed umbilicus and the somewhat different sculpture (*Strebel*). It is apparently allied to the *L. anomala* group of South America and the *L. striosa* group of the Antilles, rather than to other Mexican species.

35. L. HAPALOIDES Martens. Pl. 41, fig. 20.

Shell turrite, perforate, rather solid, subarcuately lightly plicatulate, a little glossy, white. Whorls 8, rather convex, the suture gradate, last whorl well rounded basally. Aperture slightly oblique, trapezoidal-piriform, outer margin arcuate above and below, straightened in the middle, distinctly arched forward; basal margin rather narrowly rounded.

Columellar margin a little thickened basally, arcuate, distinctly twisted and toothed in the middle, thick above, dilated, lightly concave. Parietal wall with hardly any callus. Length 11, diam. 4, aperture 3.75 x 2.33 mm. (*Marts.*).

Costa Rica: plains of the Rio Terraba, 20 meters above the sea (Pittier).

L. hapaloides MARTS., Biologia, p. 321, pl. 18, f. 16 (Oct., 1898).

"Very distinct on account of the elongated form and the arcuated folds" (of the surface).

36. L. AMBIGUA Martens. Pl. 42, fig. 22.

Shell oblong-turrite, rather widely rimate, lightly and evenly striatulate, somewhat glossy, pale yellowish, the apex obtuse. Whorls 7, rather flat, equally and slowly increasing, the suture moderately impressed; last whorl convexly tapering basally. Aperture a little oblique, piriform, the outer margin slightly arcuate, slightly arched forward, basal margin narrowly rounded. Columellar margin obliquely truncate at the base and encircled with a thin, slender, spiral fold, then a little concave; above being slightly dilated and appressed. Parietal wall slightly calloused, unarmed (*Marts.*).

Length 11, diam. 3.75 to 4, aperture 3.25 x 2 mm.

Length 10, diam. 3.5, aperture 3 x 2 mm.

Length 9, diam. 4, aperture 3 x 2 mm.

Costa Rica: Puerto Viejo, at the confluence of the Puerto Viejo and Sarapiqui rivers (Biolley); La Palma (Pittier).

L. ambigua MARTS., Biologia, p. 321, pl. 18, f. 17 (Oct., 1898).

"This species at first sight more resembles an *Opeas* than a *Leptinaria*, on account of its general form and the want of prominent costæ; the columellar margin, however, is not only obliquely notched, but has a slender spiral fold twisted round its lowest part and clearly separated from it by a slender furrow. This fold is also very much nearer the base of the aperture than in the other species of *Leptinaria*" (*Mts.*).

37. L. SOLIDA Martens. Pl. 42, fig. 37.

Shell conoidal-ovate, half-openly perforate, rather solid,

finely striatulate and ornamented with somewhat distant, membranaceous and more or less caducious riblets, whitish. Whorls 6½, the upper ones a little convex, the suture distinct, subgradate, last whorl very convex at base, somewhat sack-like. Aperture a little oblique, trapezoidal, the outer margin convexly arched forward, basal margin well rounded; columellar margin thick, vertically ascending, encircled at its lower part with a strong, entering lamelliform fold, dilated above. Parietal wall covered with a wide callus bearing a slender spiral lamella in the middle (*Marts.*).

Length 12, diam. 6.66, aperture 6 x 6 mm.

Length 11, diam. 6, aperture 5.5 x 3.5 mm.

Length 10, diam. 5.5, aperture 4.5 x 3 mm.

Length 9½, diam. 5, aperture 5 x 3 mm.

The diameter of the aperture includes the columellar margin (*Marts.*).

Costa Rica: Puerto Viejo (Biolley); Alto de Mano Tigre, near Terraba (Pittier).

L. solida MARTS., Biologia, p. 321, pl. 18, f. 18 (Oct., 1898).

38. L. ELISÆ Tristram. Pl. 42, fig. 38.

Shell conic-ovate, rather thin, semipellucid, glossy, very delicately striate; spire obtuse, conic, suture profound. Whorls 5 to 6, convex, the last more than half the length of the spire, smoothish. Columella intorted, pearly whitish inside; peristome expanded, the right margin sulcate, compressed; aperture acutely one-toothed on the inner margin. Length 10.5, diam. 6 mm. (*Tristram*).

Guatemala: Coban (Salvin).

Leptinaria elisæ TRISTR., P. Z. S., 1861, p. 231.—FISCHER et CROSSE, Miss. Scient. Mex., Moll., i, p. 625.—MARTS., Biologia, p. 322, pl. 18, f. 19.—*Tornatellina e.*, PFR., Monogr., vi, p. 263.

"The two specimens of this species sent for examination by Mr. Salvin have the shell moderately thin, imperforate, nearly smooth, ovate, pale yellowish, the whorl before the last rather large, the last seen from the dorsal side being to the rest of the length of the shell as 1 : ⅔. The columellar

margin is much arcuated beneath, thick and strongly twisted above, the twisting ending towards the underside in a strong projection. The tooth on the parietal wall is compressed, lamelliform, almost equally distant from the columella and from the outer margin, and does not reach far into the interior of the aperture. The dimensions of the two specimens are:

Long. 9½, diam. .5 (?); apert. long. 5½, lat. 3 (?) mm.

Long. 8, diam. 4¾; apert. long. 4, lat. 3 mm.

In the larger example a part of the outer wall of the aperture is broken away; therefore the diameter, both of the whole shell and of the aperture, must have been greater when entire. The other specimen possesses an equally developed tooth or plate on the parietal wall; it is probably also full-grown. In neither shell can I see what Canon Tristram meant by the words "margine dextro sulcato"; but as he gives the length as 10½ and the diameter as 6 mm., he seems to have had a larger specimen than ours" (*v. Mts.*).

39. L. STOLLI Martens. Pl. 42, figs. 26, 31.

Shell ovate-globose, rimate, thin, lightly striatulate, pale yellowish, glossy. Whorls 5, convex, with moderately impressed suture, the base of the last whorl rounded. Aperture subvertical, trapezoidal, the outer margin well arched, basal margin widely rounded, columellar margin a little concave, dilated, broadly truncate at the base and encircled with a distinct fold. Parietal wall uniplicate in the young shell. Length 7, diam. 5, aperture 4.5 x 3 mm. (*Martens*).

Western Guatemala: Retalhuleu, in woods under decayed leaves, rare (Stoll).

L. stolli MARTS., Biologia, p. 316, pl. 18, f. 9, 9*a* (1898).

The most globose of all the species within our limits (Mexico and Central America). A young shell (fig. 31), quite distinct by its form from *L. elisæ*, shows the parietal plate very clearly, but in the full-grown examples no trace of it is to be seen (*Marts.*).

40. L. CONVOLUTA Martens. Pl. 42, figs. 33, 34.

Shell conic-ovate, imperforate, diaphanous, finely striatu-

late, ornamented with some sparse membranous riblets on the upper whorls, glossy, gray. Whorls 6, moderately convex, the suture simple and moderately deep, last whorl strongly rounded basally. Aperture subvertical, emarginate-ovate, the outer margin arcuately produced, basal margin shortly rounded, columellar margin broadly truncate below, inwardly convolute, subvertical, not dilated above. Parietal wall covered with a very thin callus and encircled with a deeply entering, slender spiral lamella in the middle. Length 7, diam. 4.5 to 5, aperture 4 x 2.5 mm. (*Marts.*).

Costa Rica: Santa Clara (Biolley); Golfo Dulce (Pittier) and Turubares (Biolley), on the Pacific slope.

L. convoluta MARTS., Biologia, p. 322, pl. 18, f. 20, 20*a* (Oct., 1898).

"Beyond the spiral plate, the whole columellar margin is transversely rounded towards the interior, like a cornet or paper-bag, for which I use the term 'convolutus.' The parietal plate is very low, and only to be seen by looking into the aperture from above (fig. 34)" (*v. Mts.*).

41. L. EMMELINÆ Tristram. Pl. 42, figs. 35, 36.

Shell elongate, rather thin, opaque, glossy, slightly striatulate; spire conic, a little acuminate. Whorls 7 to 8, convex, the last scarcely as long as the spire, smoothish. Columella twisted inward, lucid whitish inside. Peristome slightly expanded, the right margin compressed. Aperture furnished with an acute tooth above. Length 15, diam. 5 mm. (*Tristram*).

Guatemala: Coban (Salvin).

Leptinaria emmelinæ TRISTR., P. Z. S., 1861, p. 231.—MARTENS, Biologia, p. 323, pl. 18, f. 21.

This form seems closely related to the large South American species. Prof. von Martens writes: "The specimens which Mr. Salvin has sent me under this name are much smaller than the measurements given by Canon Tristram, and want the parietal tooth or plate mentioned by him; they are, probably, young individuals, and the typical one seems to have been lost. That which agrees best with the descrip-

tion is only 5 mm. long (instead of 15), its diameter 3 (instead of 5), the aperture 2 long and 1½ in diameter; whorls barely 5 (instead of 7-8). The shell is distinctly perforate (this not being the case in *L. elisæ*), a character not mentioned by Canon Tristram; the columellar margin is much more feeble, and the spiral winding fold is separated by a light depression from the proper columellar margin. Although I am not quite sure that these specimens belong to the same species, I give, nevertheless, a figure of one of them" (*v. Mts.*).

Section *Neosubulina* E. A. Smith.

Proc. Malac. Soc. London, iii, p. 115 (December, 1898), for *N. harterti.*

Shell imperforate, turrite, of 8 to 10 convex whorls; aperture small, with the columella more or less truncate, and having a long entering parietal lamella. Radula with small central and tricuspid lateral teeth. Type *L. harterti.*

This group differs from typical *Leptinaria* only in its turrite instead of ovate shape; and from the long *Leptinarias* it differs by having a well developed parietal lamella. The dentition is practically the same as that of *Leptinaria.* I am unable to follow Mr. Smith in giving the group generic rank. Its mode of reproduction is unknown.

42. L. GLOYNII (Gibbons). Pl. 47, fig. 19.

"Shell subcylindrical, elongate, narrow, rather thin, semitransparent, dull yellowish-horn color, closely and rather coarsely striate by lines of growth; epidermis thin and distinct; whorls 9-10, flattened, the first 4 gradually increasing—the body-whorl rather the longest, the middle turns equal in size; spire shortly pointed; suture narrow, well marked; aperture ovate, rounded in front, narrow and angulate behind, outer lip thin and direct, gently curved, columella somewhat callous, arched with a sharper curve, ending abruptly a little behind anterior end of aperture; a thin lamina winds spirally down axis of shell, appearing in the aperture as a low, thin tooth, situated rather behind the middle of the columella. Length 13, diam. 3 mm. Animal pale grey, tentacles darker grey" (*Gibbons*).

Curacao: St. Ann's, numerous under stones (Gibbons).

Cionella gloynii Gibbons, Journal of Conchology, ii, p. 135, pl. 1, f. 1 (May, 1879).—*Cionella gloynei* Gibbons, W. G. Binney, Annals of the New York Acad. of Sciences, iii, p. 101, pl. 7, f. e (teeth).

Var. *minuscula* Pils. Pl. 47, fig. 18.

A specimen from Curacao, apparently referable to *gloynii* as a small variety, and which has lost some of the early whorls, is figured, pl. 47, fig. 18. There is a distinct contraction of the spire above the fourth whorl from the base. 6⅓ whorls remain, but there could hardly have been so many as in typical *L. gloynii*. The later whorls are rather flattened. The columella is concave above, strongly projecting below, having the oblique truncation and inwardly twisted shape usual in *Leptinaria*. The moderately strong parietal lamella enters undiminished as far as can be seen in the mouth. Length of the truncate shell 7.8, diam. 2.3, aperture 2.25 mm.

43. L. harterti (E. A. Smith). Pl. 47, fig. 17.

Shell elongate, cylindric, narrowed above, corneous, slightly shining, striated with delicate, oblique, curved growth-lines. Whorls 8, the apical two large, convex, teat-shaped, the rest somewhat convex, parted by a slightly oblique and not deep suture; last whorl hardly descending. Aperture small, inversely auriform, scarcely one-fourth the total length; lip thin, simple; columella lightly arcuate, reflexed above, spirally twisted below; parietal lamella strong, projecting, entering a long distance. Length 9, diam. 2.25, aperture 2 mm. (*Smith*).

Buen Ayre (Hartert).

Neosubulina harterti Sm., Proc. Malac. Soc. Lond., iii, p. 115, fig. II (1898).

"The mammillated apex is often slightly out of the perpendicular. On making a section of one specimen the parietal lamella was found to extend about a whorl and a half inwards. The radula, kindly examined by Mr. W. Moss, is Stenogyroid" (*Smith*).

This species is closely related to *L. gloynii* of Curacao, but it differs in having a whorl or two less, is of slightly smaller size, and has a less strongly truncate columella.

Subgenus Ischnocion Pilsbry, *nov.*

Shell imperforate, pillar-shaped, many-whorled, with large, smooth apex; aperture small, with strong, entering parietal and columellar lamellæ and a palatal fold. Type *L. triptyx.*

44. L. triptyx n. sp. Pl. 47, figs. 21, 25, 26.

Shell imperforate, pillar-shaped, very slowly tapering, rather solid, pale yellow. Surface weakly marked with oblique growth-striæ. Whorls 11, not very convex, the summit rounded, second, third and fourth whorls of equal width and calibre, then the diameter very slowly increases to the last whorl. Suture not deeply impressed, the whorl very finely crenulate below it. Aperture small, the columella concave below, twisted into a large entering fold above; parietal lamella rather low, but entering as far as can be seen. Outer lip acute, provided with an entering lamina in the middle, not reaching to the lip-edge. Length 10.2, diam. 2.2, aperture 2 mm.; diam. at second whorl 1 mm.

Colombia (R. Swift).

A remarkable shell, quite unlike any described form. In the type the palatal lamina is discontinuous, that visible from in front being succeeded deep in the throat by a second short lamina. In Fig. 25 the aperture is drawn in oblique view. In a young shell of 8¼ whorls, 6.5 mm. long, there is only a weak trace of the parietal lamella, the columellar fold is very small, and the palatal lamina weak (pl. 47, fig. 21).

Subgenus Pelatrinia Pilsbry, nov.

Embryonic and early neanic whorls vertically striate; columella strongly sinuous, truncate at base; no parietal lamella. Type *L. helenæ.*

45. L. helenæ Pilsbry, n. sp. Pl. 46, figs. 6, 7.

Shell imperforate, conic-turrite, *contracted near the summit*, thin, light brown, a little translucent. Surface glossy, the first half-whorl smooth, next two whorls very *finely and*

densely striate vertically. The striation then becomes somewhat arcuate, coarser, and thread-like, but on the last three whorls the threads give place to low wrinkles of growth. Whorls 8½, quite convex, separated by a deep suture, the last whorl inflated. Aperture slightly oblique, ovate; outer and basal margins forming an evenly curved arc, thin, not arched forward. Columella calloused, sinuous, strongly concave above, obliquely truncate at base. Parietal wall without perceptible callus. Length 18, diam. 7.8, length of aperture 6.5 mm.

Venezuela: Caracas (F. Cocking, in R. Swift coll.).

This is an extraordinary species, unlike other known forms by the contraction and sharp sculpture of the upper part of the spire and the very sinuous columella. It is larger than any other *Leptinaria* except *L. perforata* Pfr.

Genus OCHRODERMA Ancey.

Ochroderma Anc., Le Naturaliste, iii, June, 1885, p. 93, for *Tornatellina gigas*.

Shell imperforate, ovate-turrite, solid, with convexly conic summit and rather flattened whorls; covered with an olivaceous or greenish-yellow cuticle. Whorls few, 5½ to 7 in known species, the first 2½ or 3½ composing the embryonic shell, separated from the following by a *forwardly-oblique* wrinkle or line; the following whorls with normally suboblique growth-lines. Aperture ovate, armed with a deeply entering parietal lamella; columella twisted and truncate at base; outer lip usually with some trace of an entering ridge in the throat.

Jaw vertically striate (in *O. martensi*). Radula Stenogyroid, the central tooth very small, unicuspid, laterals and marginals tricuspid. Anatomy otherwise unknown.

Type *O. gigas*. Distribution, Caroline Islands and Cocos Island, in the Pacific about 550 miles southwest of Panama.

This genus differs from *Leptinaria* and *Neosubulina* by the structure of its embryonic whorls. The summit is convexly conic rather than subglobose, and the latter part of the last embryonic whorl has forwardly oblique striation, much as in

Pleurocera, the lip-edge at this stage being retracted above and produced below, as shown in pl. 47, fig. 23. The shell is usually more solid than that of *Leptinaria*, the whorls less convex, and the cuticle darker. There is usually a tendency to form an entering ridge or low, wide, callous lamella within the outer wall of the aperture. The dentition seems to be essentially that of *Leptinaria*. Some of the species have been placed in *Tornatellina*, a genus differing greatly in dentition. Mr. Ancey has referred *Stenogyra carolinæ* Martens to *Ochroderma*. I have not seen that species, and have given it temporary place in *Prosopeas* (p. 19).

The distribution of *Ochroderma* is at present inexplicable, but I find no sufficient character to justify generic separation of the American species from the type of the Caroline Islands.

I owe to Prof. H. M. Gwatkin the opportunity of figuring the radula of *O. gigas* (pl. 51, fig. 6). It has about 37, 13, 1, 13, 37 teeth. The central tooth is excessively small, with a tiny cusp; laterals tricuspid, of the usual Stenogyroid shape. The marginals are tricuspid, becoming irregular towards the outer edge. The middle cusp is wide and short, the side cusps very small, subobsolete or sometimes obsolete.

In *O. martensi* (pl. 51, fig. 11, from a co-type) there are 25, 8, 1, 8, 25 teeth. The central is larger than in *O. gigas*, unicuspid. Laterals of the usual tricuspid type. The marginal teeth are also tricuspid, the cusps small and subequal. The jaw is low, densely striate vertically, the striæ subregular, and more like fine plaits near the lower edge.

Section *Ochroderma* s. str. Shell large and heavy; central tooth very narrow; median cusp of the marginal teeth wide, the side cusps subobsolete.

1. O. GIGAS (Martens). Pl. 47, figs. 13, 14.

Shell obesely turrite, glossy, irregularly striatulate, buff; whorls 6 to 7, nearly flat, obliquely finely plicate below the impressed, brownish suture; last whorl gradually tapering to the base, imperforate. Aperture about two-fifths the shell's length, vertical, sinuate-piriform, acutely angular above, the right margin unexpanded, thin, columellar margin widely ap-

pressed, white, with two weak, very oblique folds above and conspicuously obliquely truncate below; parietal fold strong, compressed, horizontally entering. Length 44, diam. 16, aperture 17.5 x 9 mm. (*Marts.*).

Caroline Is.: Ruk or Hogolu Island (O. Finsch).

Tornatellina gigas Marts., Sitzungsber. Ges. naturforschender Freunde in Berlin, Nov., 1880, p. 146; Conchol. Mitth., i, 91, pl. 17, f. 1-5.—Ancey, Le Naturaliste, iii, 1885, p. 93; Journ. de Conchyl., 1903, p. 100.

This splendid snail is remarkable for the solidity of the shell, which is white under a cuticle of ochraceous or greenish-ochre color. The apical whorls to the number of about 3½ are faintly, delicately decussate. The growth-striæ are nearly straight and vertical at first, but on the last half-whorl of the embryonic shell they become oblique, bending forward below; there is then an oblique, forwardly-descending shallow groove and wrinkle at the end of 3½ whorls, marking the limit of the nepionic stage. In the neanic stage the faint growth-striæ become arcuate in the normal direction. The outer lip is thin and sharp but rapidly thickens in the throat, where there seems to be the weak trace of a thicker median callus.

Section *Ochrodermella* n. sect. Shell small. Central tooth larger than in *Ochroderma*, about one-third as wide as the adjacent laterals. Marginal teeth with three subequal cusps. Type *O. martensi.*

The three species of this Cocos Island group are closely related, and further collections are needed to show whether they are really separable specifically.

2. O. cumingiana (Pfeiffer). Pl. 47, fig. 20.

Shell ovate-oblong, solid, striatulate, covered with an olivaceous-buff cuticle. Spire long-conic, the apex acute. Whorls 5½, slightly convex, the last about three-sevenths the total length. Columella subarcuate, distinctly and obliquely truncate. Parietal wall bearing a large, horizontally-entering lamella. Aperture semioval, calloused within; peristome simple, acute. Length 8, diam. 3.66, aperture 3.66 x 1.66 mm. (*Pfr.*).

Nicaragua: Realejo (Real Llejos) (Cuming). Cocos Island (Ancey).

Tornatellina cumingiana Pfr., Proc. Zool. Soc. Lond., 1849, p. 134; Conchyl. Cab., *Pupa*, p. 148, pl. 18, f. 6, 7; Monogr., iii, p. 525.—Martens, Biologia Centrali Americana, Moll., p. 324.—*Leptinaria c.*, Pfr.—Cless., Nomencl. Hel. Viv., 1878, p. 336.—*Ochroderma cumingiana* Pfr., Ancey, Journ. de Conch., li, 1903, p. 102.

Mr. Ancey has identified this species from Cocos Island. He considers *Tornatellina pittieri* Martens as probably identical. That they are closely related is obvious, and I am disposed to concur in uniting them; yet according to the published figures, *pittieri* is a somewhat more lengthened shell than *cumingiana*.

3. O. pittieri (Martens). Pl. 47, figs. 15, 16.

Shell sinistral, imperforate, conoid-turrite, solid, smooth, glossy, whitish-corneous. Spire elongate, the apex rather obtuse; suture impressed, simple. Whorls 6½, a little convex, the last rounded basally. Aperture slightly exceeding one-third the total length, rather oblique, lanceolate, the outer margin slightly arcuate, thin, convex forwardly, basal margin narrowly rounded, columellar margin strongly arcuate, very distinctly obliquely truncate at the base; parietal wall provided with a compressed, strong, entering lamella. Length 9.5, diam. 4, oblique length of aperture 3.5, width 2 mm. (*Marts.*).

Cocos Island (Pittier).

Tornatellina pittieri Marts., Sitzungsber. Ges. nat. Freunde zu Berlin, 1898, p. 157; Biol. Centr. Amer. Moll., p. 640, pl. 44, f. 10.

The type figure is copied, pl. 47, fig. 16.

A fully adult shell referable to *O. pittieri* is figured, much enlarged, on pl. 47, fig. 15. The cuticle is olive profusely streaked and spirally lined with light buff. The apex and sutures are eroded. Within the mouth there is a low but strong entering ridge in the middle of the outer wall. Length 10, diam. 4, aperture 4 mm. This shell differs from *O. pit-*

tieri as described by von Martens in color, but seems to be the same species. Probably *O. martensi* is a dextral form of *O. pittieri.*

4. O. MARTENSI Dall. Pl. 47, figs. 22, 23, 24.

"Shell small, of a yellowish-green color, polished, with 5½ whorls, a rather blunt apex and distinct suture; under magnification the upper whorls are seen to be minutely axially wrinkled, most distinctly so in front of the suture, but in the later whorls this sculpture becomes obsolete. There is also a fine, obscure, spiral striation, and in certain spots, under magnification, the two series of lines form a faint reticulation. The shell has much the general form of *Cochlicopa lubrica*, the aperture is small, semilunate, the pillar obliquely truncated, somewhat thickened at the twisted edge; on the body is a very prominent projecting lamina which extends inside the shell for about one whorl, projects at the mouth half-way to the outer lip and is united to the pillar and outer lip by a thin callus; the outer lip is not reflected, but is not sharp-edged in the adult; directly opposite the parietal lamella is a single thickened spiral ridge, but little elevated, and extending inward about one-third of the last whorl. Alt. of shell 10, of aperture 4.25; lat. of shell 4, of aperture 2 mm." (*Dall*).

Cocos Island, under stones (Snodgrass and Heller).

Leptinaria (*Neosubulina*) *martensi* DALL, Proc. Acad. Nat. Sci. Phila., 1900, p. 97, pl. 8, f. 10 (April 16, 1900).

"An immature dextral specimen among the seven sinistral *L. pittieri* v. Marts. may have belonged to this species. It differs from that species by being dextral, by having a mouth larger in proportion to the spire, and in having one less whorl in a somewhat greater length" (*Dall*).

The type figure is copied, fig. 22. Another specimen of the original lot is drawn on a large scale, fig. 24, length 10, diam. 4, aperture 4.2 mm., with 5¾ whorls. The parietal lamella enters slightly less than one whorl. Within the mouth a low, inconspicuous thickening on the outer lip, entering the throat, may be seen on careful inspection.

The summit of a young specimen is drawn, pl. 47, fig. 23, to show the slight distortion at the junction of the embryonic with the neanic stage, accompanied by a change in the direction of the striæ. This shell is more distinctly striate than the larger one figured. The name *L. martensi* is preoccupied, but pending a thorough inquiry into the status of the Cocos Island forms, no change is advisable.

Subfamily Cœliaxinæ Pilsbry.

Cylindric or turrite, narrow, many-whorled forms, with the axis hollow (except in Cryptelasmus), and the cavity of the whorls obstructed by lamellæ on the axis, parietal wall and sometimes the basal wall. Dentition Achatinoid.

This subfamily is composed of a few very distinct genera, all of them at present monotypic. Widely scattered, yet each is restricted to an excessively small area. It would seem to be a group evolved in Mesozoic time and now approaching extinction. The several genera were first associated by the author in 1904 (Man. Conch., xvi, p. 194).

I. Shell imperforate, its axis slender and solid; oviparous; American.

a. Shell very slender, sinistral, turrite with cylindric summit; composed of 11-15 narrow whorls, one or two intermediate whorls obstructed by a parietal and two axial lamellæ; aperture oblique, ovate, with a parietal lamella. Genus Cryptelasmus Pils.

II. Shell perforate or umbilicate; viviparous; Eur-African.

a. Shell with 12-13 whorls, the initial 3½ forming a narrow, subcylindric summit; last two whorls with an axial and a parietal lamella, the latter continued to the aperture; outer lip simple and thin. Island of St. Thome, in the Gulf of Guinea.

b. Axis perforate. Genus Thomea Girard.

bb. Axis openly umbilicate.

Genus Pyrgina Greef.

aa. Shell tapering-cylindric, ribbed, with a peripheral and a basal keel on the last whorl, the latter bounding an open umbilicus; outer lip with a collar-like rib; cavity of last whorl with axial and palatal lamellæ and a basal fold. Eocene, Paris Basin.

Genus Distœchia Crosse.

aaa. Shell long-turrite, of 19-21 whorls, the last rounded; aperture short, with small parietal and axial lamellæ, the latter several whorls long; young shells with parietal, axial and basal lamellæ in one or more intermediate whorls. South Africa.

Genus Cœliaxis Ad. et Ang.

Genus CRYPTELASMUS Pilsbry, nov.

Shell imperforate, sinistral in known species, very slender, turrite, many-whorled (11 to 15). Apex very obtuse and somewhat bulging, smooth. Aperture ovate, oblique, the outer lip simple, columella straightened; parietal wall armed with an entering lamella. *Cavity of one or two intermediate whorls obstructed by lamellæ on the parietal wall and columella;* the central axis elsewhere thin and straight. Soft anatomy unknown.

Reproduction oviparous, the eggs flattened, hard-shelled. Type *Balea canteroiana* 'Gundl.' Pfr.

Illustrated on plate 48. The single species composing this genus has no near relatives in America. The internal lamellæ remind one of the Urocoptid groups *Esochara* and *Sectilumen.* They appear very early, certainly near the beginning of the neanic stage, how much earlier we do not know. Among Achatinoid snails the genus seems related, though not closely, to *Cœliaxis* of South Africa.

Cryptelasmus is confined, so far as we know, to the south coast of Central Cuba.

C. canteroiana ('Gundlach,' Pfr.). Pl. 48, figs. 1, 2, 4, 5, 7.

Shell imperforate, sinistral, turrite, thin, striate, waxy-hyaline. Spire long, the apex rather obtuse. Whorls 13, a trifle convex, the last scarcely over one-sixth the total length, rounded at base. Columella simple, subvertical. Aperture oblique, semioval, with an entering, compressed, subhorizontal, parietal lamella; peristome simple, unexpanded, the right margin arching forward. Length 15, diam. 2.66, aperture 2.5 x 1.5 mm. (*Pfr.*).

Cuba: La Vigia, Trinidad (Gundlach, Pilsbry); a variety at "Lagunilla," near Cienfuegos, province of Santa Clara (Pilsbry).

Balea (?) *canteroiana* Gundl., Pfr., Malak. Bl., iv, 1857, p. 107; Monogr., iv, p. 715.—Arango, Fauna Mal. Cubana, p. 89.—*Pseudobalea c.*, Crosse, Journ. de Conchyl., 1890, p. 244.

The parietal lamella in the adult form is nearly one whorl long. In the third whorl from the base there are three lamellæ: parietal and axial large, the latter thick at the edge, and a small lower axial; none of them extend into the next earlier whorl (fig. 2, shell 13.7 mm. long). The two specimens figured measure:

Length 16, diam. 3, aperture 2.7 mm.; whorls 15.

Length 16.8, diam. 3, aperture 3 mm.; whorls 15.

Figs. 1, 2, 4, 5, 7 represent specimens from a cave near the foot of the hill "La Vigia" at Trinidad. Figs. 3, 6, 8, 9 are the variety from near Cienfuegos, where I found it in some numbers, but chiefly dead and broken.

The eggs (pl. 48, figs. 4, 5, Trinidad) are calcareous-shelled as usual, quite flattened, and 1.25 mm. in greatest diameter. The embryonic shell is smooth and very obtuse above, the first and second whorls are disproportionately large, the third narrower.

Var. *cienfuegosensis* n. subsp. Pl. 48, figs. 3, 6, 8, 9.

The shell is smaller than typical *canteroiana*, with fewer whorls than young shells of the latter of the same length; the internal lamellæ are longer, all thin-edged; apex a trifle larger; aperture relatively larger.

Length 13.5, diam. 3 mm., whorls 13.

Length 12.3, diam. 2.8 mm., whorls 11½.

A shell of 3.5 mm. length with 4½ whorls (fig. 9, Cienfuegos) has the parietal lamella well developed, extending inward about 2 whorls, being visible through the transparent shell. The axial lamella is also strong, and continues to the columella. At a somewhat later stage, length 6 mm., both of the lamellæ are 2½ whorls long (fig. 6, Cienfuegos). At the adult stage (fig. 3) the Cienfuegos race has a parietal lamella about one whorl long, the axis in the last two whorls being simple, straight and slender. In the third whorl from the

base there are three thin lamellæ, a large parietal, a very large axial, and a very small, oblique axial below. The two larger lamellæ extend into the next preceding whorl (fig. 3, a shell 12 mm. long). In a specimen of the Trinidad *canteroiana* 12 mm. long there are 14 whorls, while *cienfuegosensis* of the same length has but 11½ to 12 whorls.

Genus THOMEA Girard.

Thomea Girard, Jornal de Sciencias Math. Phys. e Nat. Acad. Real das Sci. de Lisboa, Ser. 2, iii, p. 106 (1893).

"Shell very small, dextral, turriculate, composed of numerous slowly widening whorls, striate, perforate, thin. Whorls convex with well-marked suture. Aperture oval, the columellar margin reflexed, continuous with the peristome, which is simple and acute, with the margins united by a well-defined parietal callus, bearing a parietal lamella visible externally; columella with a fold not visible externally.

"Radula with a very small central tooth with obsolete cusp; laterals tricuspid; marginals very short, transverse, armed with 4 to 7 cusps. Formula 16, 8, 1, 8, 16.

"The animal is viviparous, young shells taken from an adult shell measuring 2 mm. long" (*Girard*).

Type *T. newtoni* Girard. Distribution, Island of St. Thomé, in the Gulf of Guinea.

This group might more justly be ranked as a subgenus of *Pyrgina*, from which it differs only in the reduction of the axial tube to a narrow perforation.

1. T. newtoni Girard. Pl. 49, figs. 17, 18.

Shell dextral, long, turriculate, thin, covered with a corneous cuticle; ornamented with longitudinal striæ which are quite regular, rather thick, a little sinuous and but slightly oblique. Whorls 12 or 13, slightly convex with well-marked suture, regularly and very slowly increasing. 3½ embryonic whorls nearly smooth; last whorl about one-fourth the total length, a little angular at base. Umbilical perforation narrow, a little covered by the reflexed, straight columellar border. Aperture oval, a little retracted at base; peristome with thin, sharp borders, united by a light callus. There is a low

columellar or axial lamella in the last whorl, not visible from the exterior, and a parietal lamella passing out beyond the plane of the peristome. Length 15, diam. 4, aperture 2 x 2 mm. (*Girard*).

Island of St. Thomé at Binda, Morro de Gentio, Gumbella and Rio Quija (F. Newton).

Thomea newtoni GIRARD, t. c., p. 107, pl. 1, f. 16, 16*a*, 17 (shell), 18*a*, *b* (teeth).

The embryonic young shells have a parietal lamella. In the adult it is absorbed except in the last two whorls.

Genus PYRGINA Greef.

Pyrgina GREEF, Zool. Anzeiger, 1882, p. 518; Sitzungsber. der Ges. Naturwiss. zu Marburg, 1884, p. 52.—GIRARD, Jornal, etc., iii, p. 108 (1893).

Shell dextral, cylindric, turriculate, composed of numerous narrow, lightly striate whorls. Embryonic whorls elevated in a point above the rest. Last whorl carinate at base. Aperture oval, angular; peristome simple and acute, the margins joined by a light callus. A parietal lamella visible at the mouth, and a columellar fold within, not visible externally. Umbilicus round, open and deep (*Girard*).

Soft anatomy unknown; but from its close resemblance to *Thomea* there can be little doubt that *Pyrgina* also will prove to be viviparous with a Stenogyroid dentition. The single species is from St. Thomé Island in the Gulf of Guinea.

1. P. UMBILICATA Greef. Pl. 49, figs. 15, 16.

Shell dextral, cylindric, turriculate, thin, covered with a corneous-brown cuticle. Spire of 13 very narrow whorls. 3½ embryonic whorls form a projecting point above the following ones; the latter are slightly convex, parted by a well-marked suture, and covered with slightly oblique, light, longitudinal striæ. Last whorl a little swollen, carinated at the base around the umbilicus. Umbilicus rounded, very open, prolonged in a grooved column. Aperture oval, a little angular at the base, with thin, sharp margins. Columella lightly reflexed, the margin joined by a light callus. There is a columellar fold not visible outwardly, and a parietal

lamella reaching to the plane of the peristome. These two lamellæ are resorbed above the penult. whorl, but vestiges of them are visible throughout the extent of the axis. Length 7.5, diam. 2.5 mm. (*Girard*).

Pyrgina umbilicata Greef, Zool. Anzeiger 1882, p. 518; Sitzber. Marburg 1884, p. 52.—Girard, Jornal iii, p. 108, pl. 1, f. 19, 20.

Island of St. Thomé, at Roca Monte Cafe, 800-900 meters above the sea (Greef); Palanca (Newton).

Six individuals were taken by Mr. Greef, seven by Mr. F. Newton, the latter all dead and without cuticle. It seems to be very rare.

Genus DISTŒCHIA Crosse.

Distœchia Crosse, Journ. de Conchyl. for 1890, p. 164, for *Cylindrella parisiensis* Desh (1890).—"*Distœctria* Cossmann Mss.," Harris & Burrows, The Eocene and Oligocene Beds of the Paris Basin, pp. 100, 114 (Sept. 23, 1891).—*Spartina* Harris & Burrows, t. c., pp. 100, 113.—*Cylindrella* Desh., Anim. sans Vert. du Bassin de Paris, ii, 872.—Cossmann; Ann. Soc. Roy. Malac. de Belgique, xxiv. 1889, p. 358.

Shell tapering-cylindric, with an obtuse, smooth apex, usually lost in mature shells; longitudinally ribbed; last whorl with a strong, cord-like basal carina, the base smooth, another keel around the large umbilicus; last whorl becoming free in front. Aperture irregularly oval, the outer and basal lips shortly built forward beyond a strong collar-like rib; inner lip blunt. Axis large and hollow, open below. Cavity of the shell contracted by a thin, spiral lamella above the middle of the axis, extending nearly to the aperture, and within the last whorl there is also a palatal fold and a stout basal fold. Type *D. parisiensis* Desh., pl. 49, figs. 19-22.

Distribution: Lowest Eocene of the Paris Basin, at Jonchery and Chenay.

This group, based upon a single species, is apparently related to *Pyrgina* and *Thomea* of St. Thomé, and in a less degree to *Cœliaxis* of South Africa; all having the same general type of internal armature, of external sculpture, and a

similar hollow axis. *Distæchia* cannot, however, be regarded as ancestral to the recent genera, since by its free last whorl and collared peristome the Eocene genus is obviously already a senile phylum. The Eocene of western Europe, like the modern Antillean fauna, contained many senile types of land snails, which left no descendants.

The name proposed by Crosse for this genus suffered some mutilation at the hands of Messrs. Harris and Burrows, who also added the synonym *Spartina*. Both names were used by them—"*Distæctria* (*Spartina*) *parisiensis* Desh."—for the one species in their first reference (*t. c.*, p. 100), so that their subsequent statement (pp. 113, 114) that the new names were intended as substitutes for *Cylindrella* and *Thaumasia*, respectively, cannot affect their true status as synonymous terms applying to the species *parisiensis*.

Genus CŒLIAXIS Adams and Angas.

Cœliaxis Ad. and Ang., Proc. Zool. Soc. Lond., 1865, p. 54, based upon *C. layardi* only.—Pilsbry, Man. Conch., xvi, 194. —*Bathyaxis* Ancey, Conchologist's Exchange, ii, p. 39 (September, 1887), same type.—*Sphalerostoma* Girard, Jornal de Sciencias Math., Phys. e Nat. Acad. Real Sci. de Lisboa (2 ser.), ii, p. 247 (1892), same type.

Shell umbilicate, long, turrite, composed of many (about 20) closely coiled whorls; the upper half attenuate, apex rounded, rather large, the first whorl smooth, the rest vertically rib-striate. Early whorls sometimes lost in the adult shell. Aperture small, ovate, the blunt lip slightly expanded, columellar lip rolled back. Axis hollow, tubular and straight, encircled by a single cord-like lamella below the middle in each whorl in adult shells, terminating in a small columellar fold. Young with strong, spiral, parietal and basal lamellæ and an oblique columellar barrier in the antepenult. whorl.

Jaw highly arched, and either very weakly ribbed (plaited) or with sparse striæ. Radula (pl. 51, figs. 7, 8) with 21, 1, 21 teeth in slightly, regularly arcuate rows. Middle tooth narrow, less than half the width of the adjacent laterals, with a short, simple cusp. Laterals having a large mesocone and

well developed ectocone, but no trace of an inner cusp. Marginal teeth similar, the ectocone split on a few of the outer ones.

Soft anatomy otherwise unknown. Reproduction viviparous.

The snail burrows in sand among grass and bushes.

Type *C. layardi.* Distribution, South Africa. (*Cœliaxis,* hollow axis.)

This monotypic genus stands isolated in the recent fauna, but it seems to have distant relations with *Thomea, Pyrgina* and *Cryptelasmus.*

The name Cœliaxis *was originally based upon* C. layardi *only,* though in a later publication its authors enlarged the definition to include *C. exigua* (P. Z. S., 1867, 907). The efforts of Messrs. Ancey and Girard to displace *Cœliaxis* by other generic names for *C. layardi* must therefore be viewed as energy misdirected.

C. exigua, which Adams and Angas described as a *Cœliaxis,* belongs to the genus *Cœlocion* Pils. (Manual, vol. xvi, p. 190). It has been referred erroneously to the genus *Perrieria.*

1. C. LAYARDI (Adams & Angas). Pl. 49, figs. 11, 12, 13, 14.

Shell narrowly umbilicate, tapering-cylindric below, the upper half strongly tapering and attenuate, with slightly concave outlines, the apex globose and a little enlarged, frequently truncate in adult shells; thin but rather strong, corneous, rather glossy; sculptured with close, fine and thread-like rib-striæ, which are about as wide as their intervals, but slightly oblique, and sometimes are more crowded on the last whorl. Whorls 20-21 in perfect shells, only slightly convex, the last rounded below, without trace of a basal carina. Aperture slightly oblique, irregularly ovate. Peristome thin or a little thickened, obtuse, slightly expanded, the columellar margin dilated and reflexed. Columella vertical, slightly concave, bearing a small fold below. Internal axis hollow, tubular and straight, encircled below the middle of each whorl by a cord-like spiral lamella which extends upwards about 3½ whorls from the base. Adult shells have a lamella

within the fourth or fifth whorl from the base, hanging from the upper or parietal wall (pl. 49, fig. 12, *p. l.*). Immature shells have large but short lamellæ on the parietal and basal (upper and lower) partitions, and an obliquely subvertical lamella on the axis (figs. 13, 14). The spiral, axial cord continues inward a short distance beyond the vertical lamella. This armature is in the 17th or 18th whorls.

Length 31, diam. 7.8 mm.

Length 29.3, diam. 7 mm.

Length 28, diam. 7 mm., whorls 19 (Angas' type).

South Africa: East London, mouth of the Buffalo river; Tharvield, living under the sand among bushes (E. L. Layard); Port Elizabeth (Jas. Crawford).

Subulina (*Cœliaxis*) *layardi* H. Adams and G. F. Angas, P. Z. S. Lond., 1865, p. 54, pl. 11, fig. 1.—*Bulimus layardi* Ad. and Ang., Pfr., Monogr., vi, p. 95.—*Cœliaxis layardi* Layard, P. Z. S., 1881, p. 839 (living animal).—*Bathyaxis layardi* Ancey, Conchol. Exch., ii, 1887, p. 39; Journ. de Conchyl., 1901, p. 223.—*Sphalcrostoma l.*, Girard, *l. c.* 1892, p. 245-247, and vol. iii, 1893, pl. 1, f. 3, 3*a*.

Mr. Layard, who collected living examples, states that it is viviparous; eight or ten minute ones were shaken out of a dry shell. None of those I opened contained young, much to my regret, as the internal armature of the embryonic shell will probably be of high interest.

Girard found two sets of barriers in a shell opened and figured by him.

APPENDIX.

Homorus pileatus (Martens). Pl. 12, figs. 7.

Shell turrite, subobliquely costulate, with a silky luster, waxen-whitish; the apex is obtuse, whorls 9, the first depressed, the second subglobose, both distantly and vertically costulate; the following whorls regularly increasing, but slightly convex, the last ovate-oblong, slightly angular below the periphery and more finely striolate there. Aperture two-

sevenths to three-elevenths the total length, moderately oblique, rhombic-piriform; peristome thin, the columellar margin slightly arcuate, very obliquely truncate, parietal callus distinct. Length 26, diam. 7.5 mm., aperture 7 mm. long, 3.5 wide (*Marts.*).

West Africa: Cameroons at Bonjongo (Buchholz), Bibundi, Bonge, Buea and Barombi (Sjostedt *et al.*).

Stenogyra pileata Martens, Monatsber. K. P. Akad. Wissensch. zu Berlin, 1876, p. 261, pl. 3, f. 12, 13; Sitzungsber. Ges. naturf. Freunde, 1891, p. 31.—*Homorus pileatus* d'Ailly, Bihang, etc., p. 110.

Distinguished by the first two whorls, which give the upper end a cap-like aspect, and in this respect resembling *S. calabarica;* otherwise with the appearance of *S. vivipara* (*Marts.*).

D'Ailly reports a specimen from Bonge 33.5 mm. long with 11 whorls. The eggs, according to the same author, are nearly spherical, 2 mm. in diameter. The apical sculpture is that of *Pseudoglessula*, but d'Ailly removes it to *Homorus* on account of the color of the shell and the shape of the eggs.

Euonyma natalensis (Burnup). Pl. 31, figs. 12, 13.

The original description may be found on p. 41. Specimens in the collection of the Academy, overlooked until recently, show that the shells described by Mr. Burnup are immature. It attains a large size, being in fact the largest of the genus. It is pale straw-colored, solid though rather thin, and has a beautiful silky luster produced by very fine and closely crowded but distinct striæ, which arch forward rather strongly below the suture. The columella is straight in the stouter examples, concave in the slender one, and its reflexed edge leaves a narrow umbilical crevice. The specimen drawn in fig. 13 has lost several whorls, but fig. 12 has lost only one or less; so that the count of whorls in entire examples would be greater than given below. It is evident, however, that self-amputation is habitual in the adult stage. All have the breach closed by a long septum.

Length 51, diam. 13.5, aperture 15.1 mm.; whorls 9.

Length 43, diam. 11.5, aperture 13.2 mm.; whorls 11½.
Length 56, diam. 12, aperture 14.8 mm.; whorls 12½.

Curvella minuta Da Costa. Pl. 50, figs. 29, 30, 31.

Shell oblong-ovate, umbilicate, arcuately wrinkle-striate, thin, chalky, white. Whorls 5½, convex, the last three-fifths the total length. Aperture semioval; peristome simple, the right margin arcuate, receding above. Columellar margin straight, dilated and reflexed. Length 7.5, diam. 4.5, aperture 5 x 2.5 mm. (*Da Costa*).

Philippines: Malbato, Busuanga I. (Hungerford).

C. minuta Da C., Proc. Malac. Soc. London, vii, p. 99, pl. 11, f. 12-14 (June, 1906).

Curvella alabastrina Da Costa. Pl. 50, figs. 27, 28.

Shell oblong-ovate, umbilicate, thin, glossy, arcuately wrinkle-striate, pellucid, whitish. Whorls 6, a little convex, the last three-fifths the total length. Aperture oval. Peristome simple, the right margin arcuate; columellar margin straight, slightly receding, dilated and reflexed. Length 17, diam. 9, aperture 9 x 4.5 mm. (*Da Costa*).

Philippines: Guimaras (Hungerford).

C. alabastrima Da C., Proc. Malac. Soc. London, vii, p. 99, pl. 11, f. 10, 11 (June, 1906).

P. 104. The generic term *Zootecus* has been changed on etymological grounds to *Zootocus* by von Martens, Archiv für Naturgeschichte for 1895, p. 107, in text. Such emendation is considered not allowable by the majority of recent zoölogists. From the biological standpoint *Zootecus* is as good as *Zootocus*.

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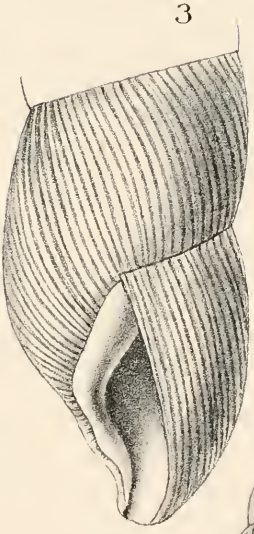
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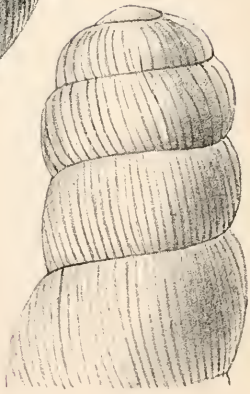
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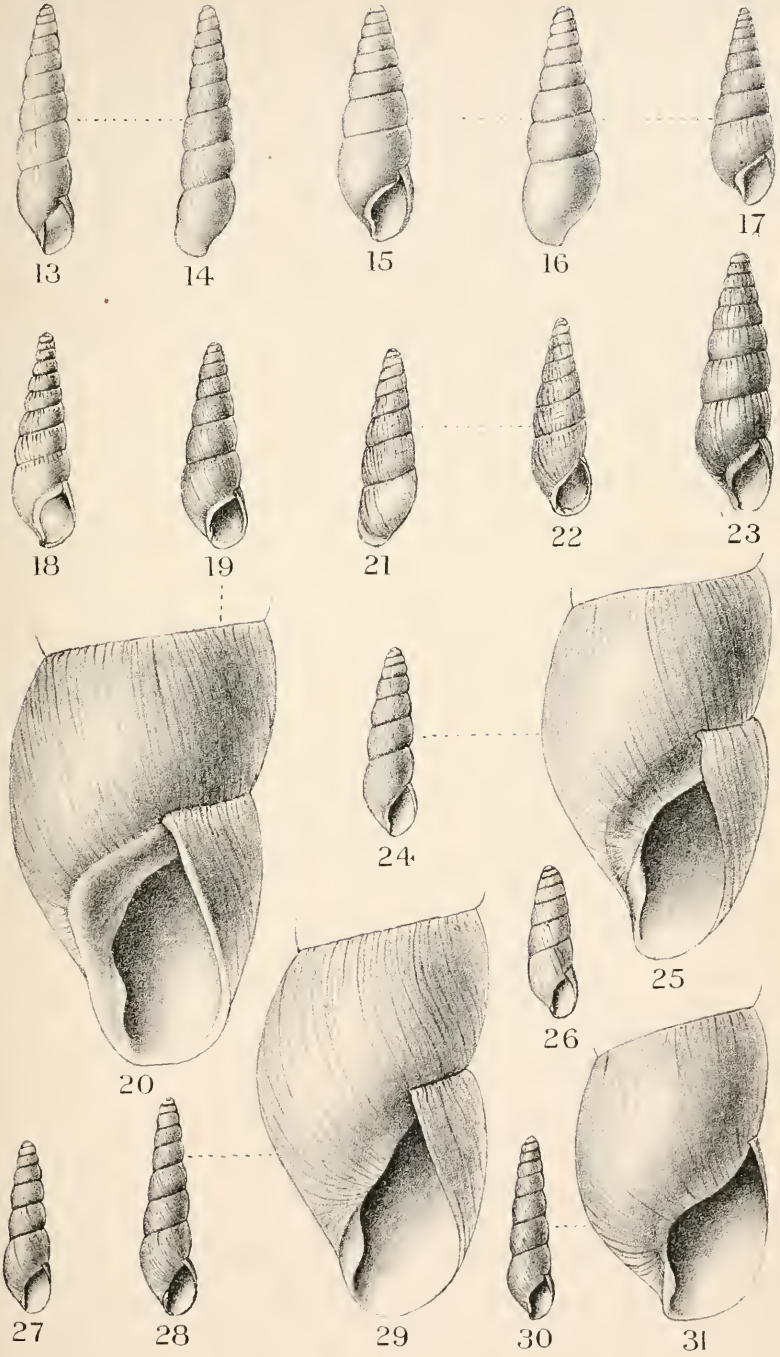
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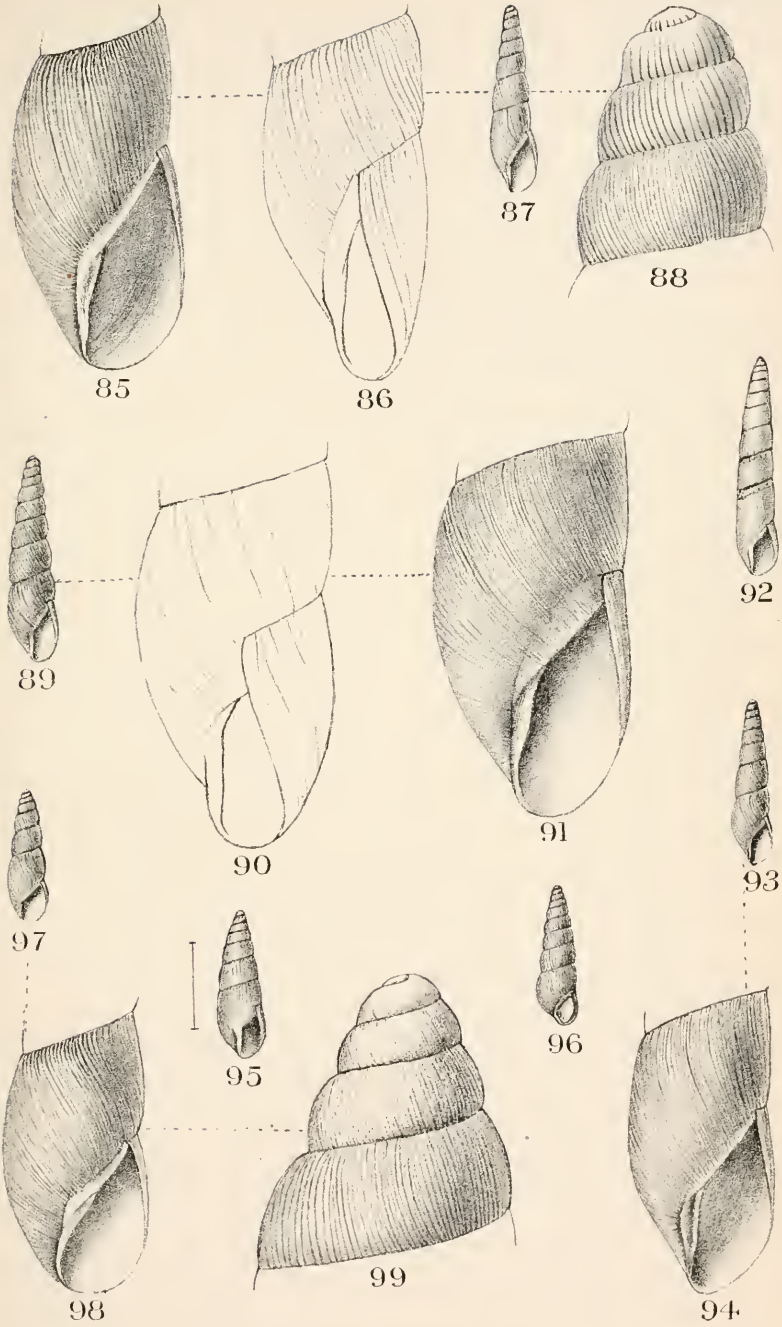
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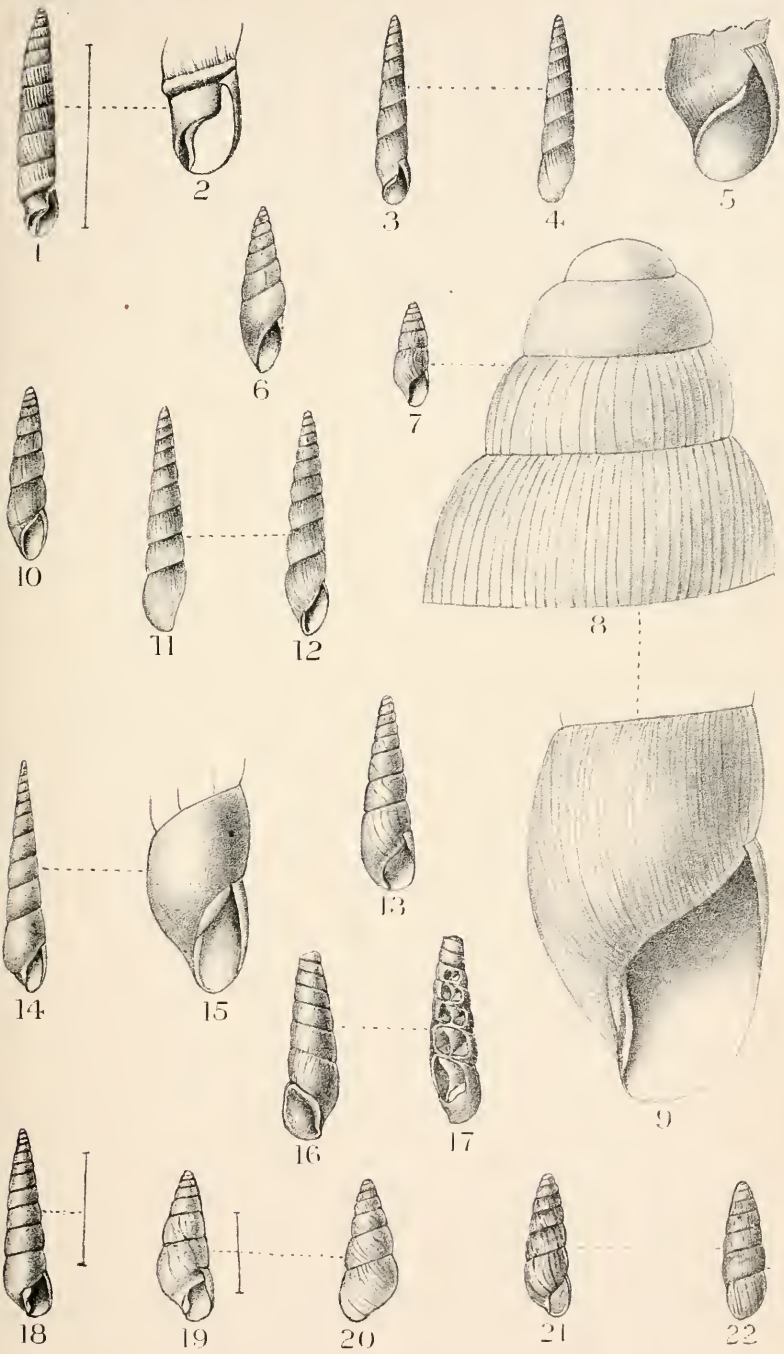
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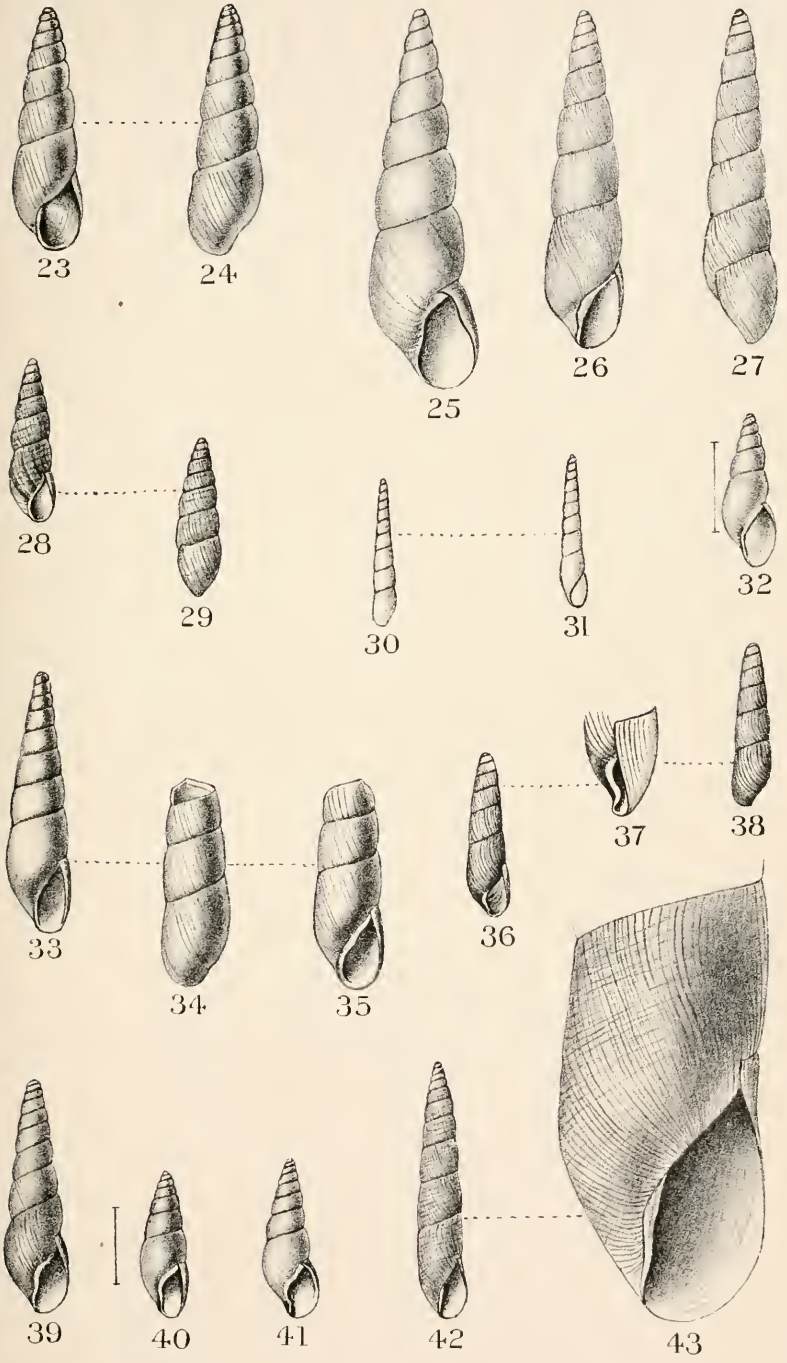
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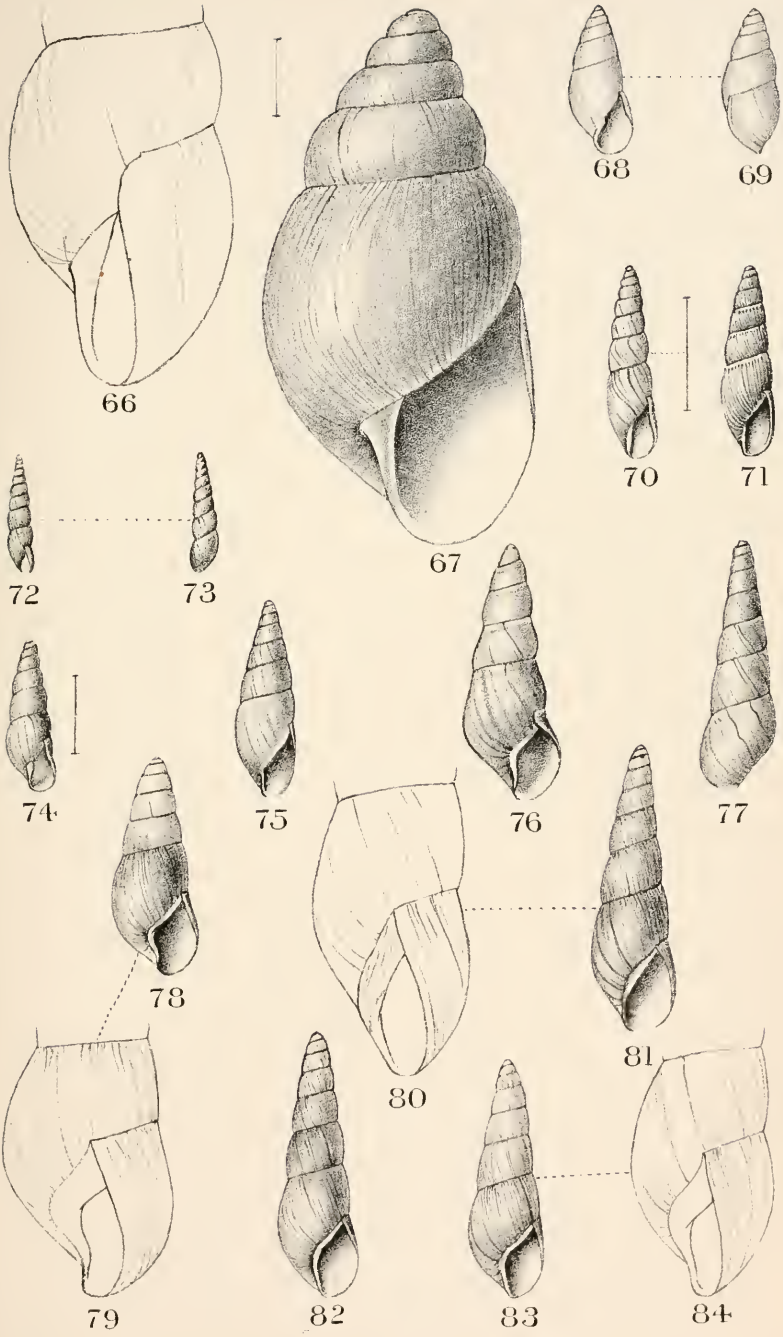
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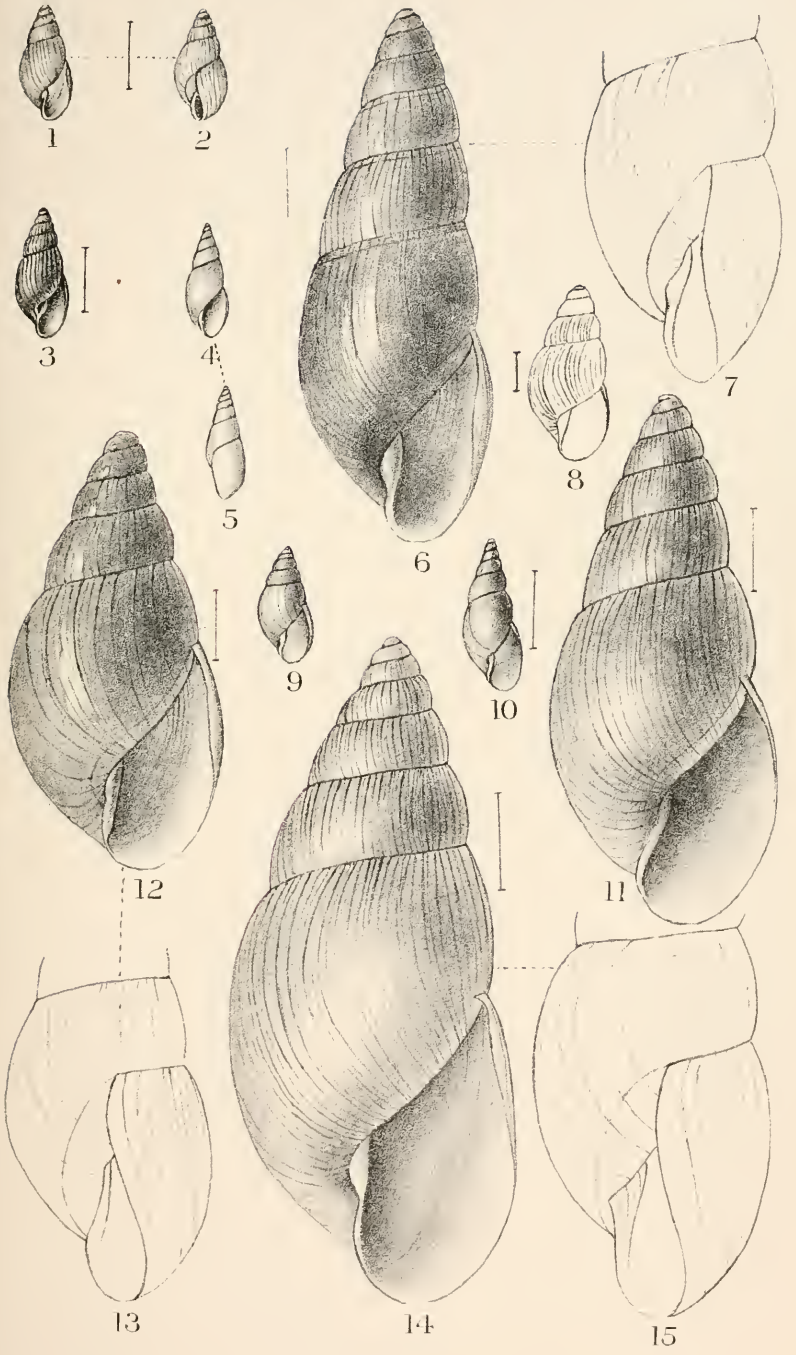
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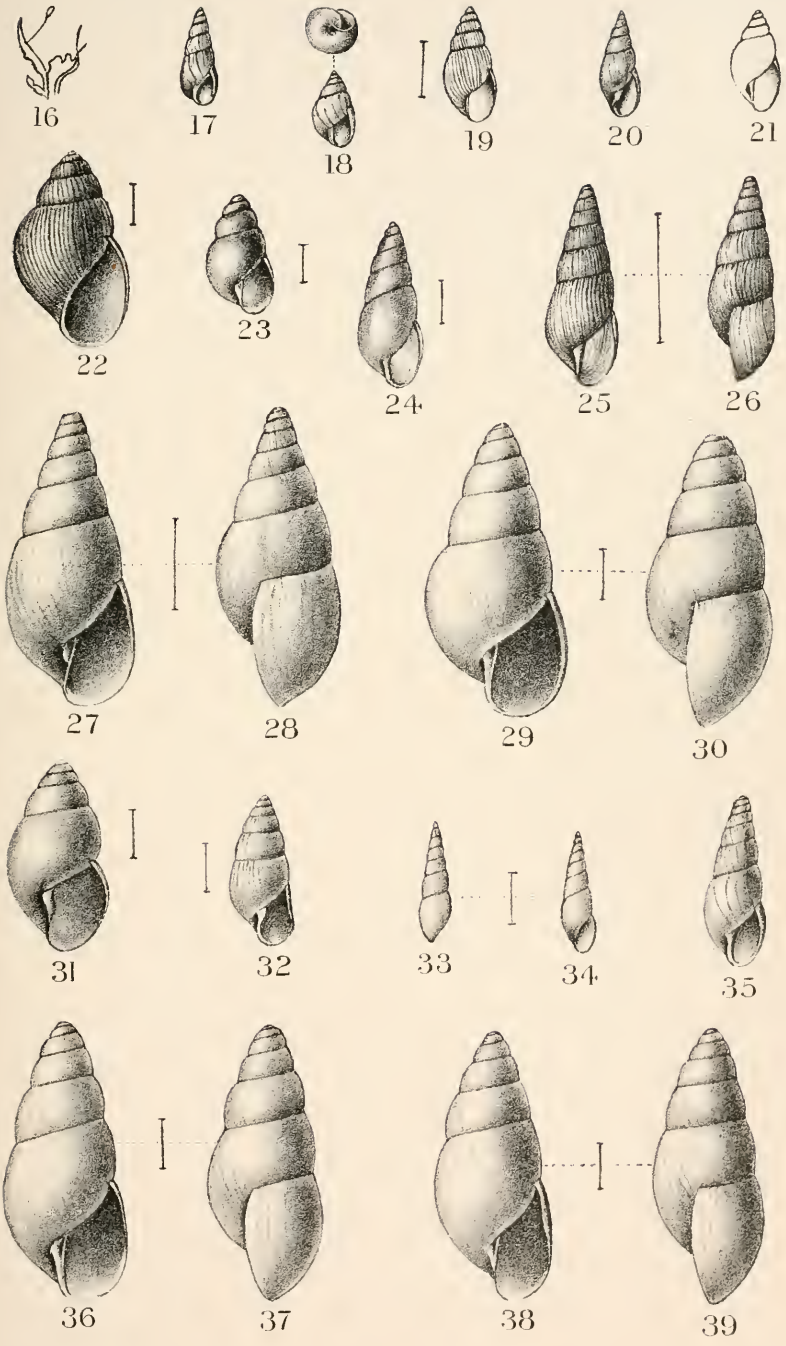
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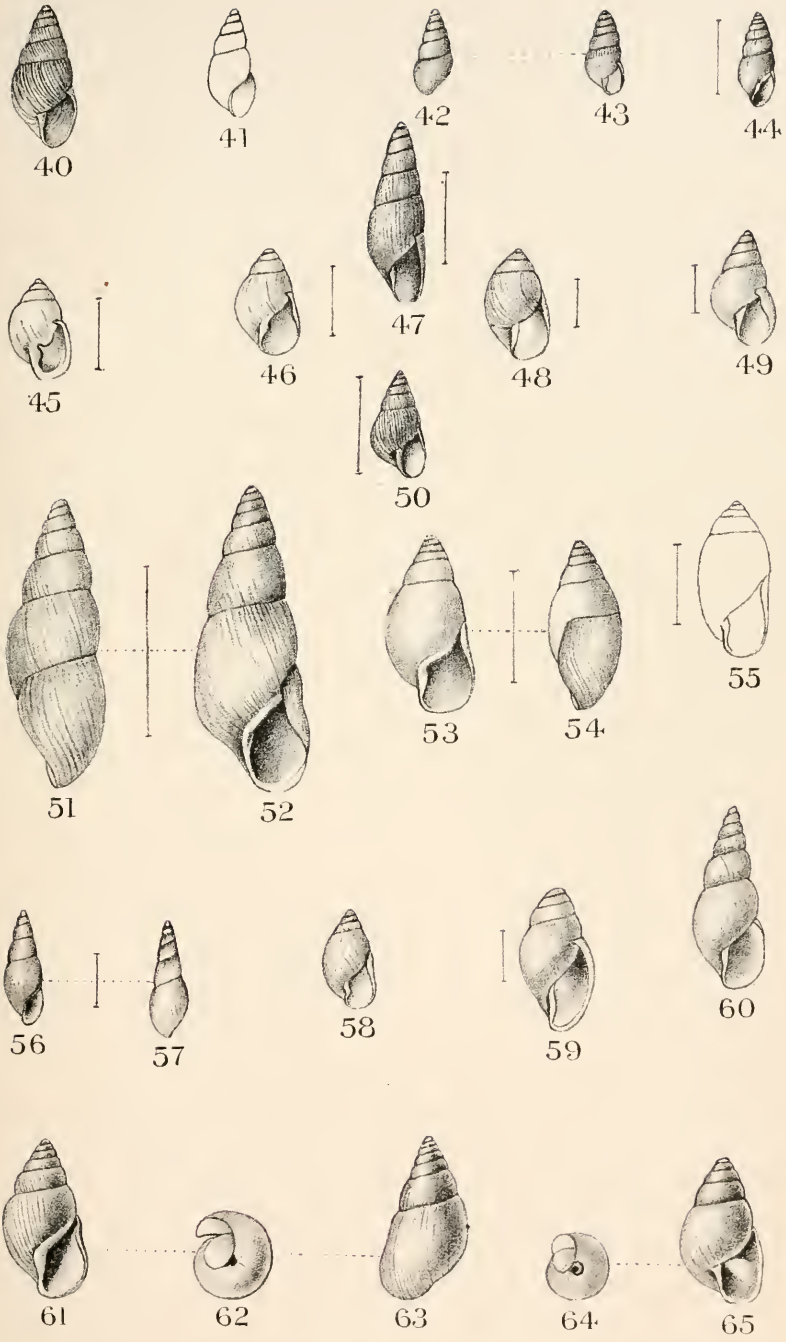
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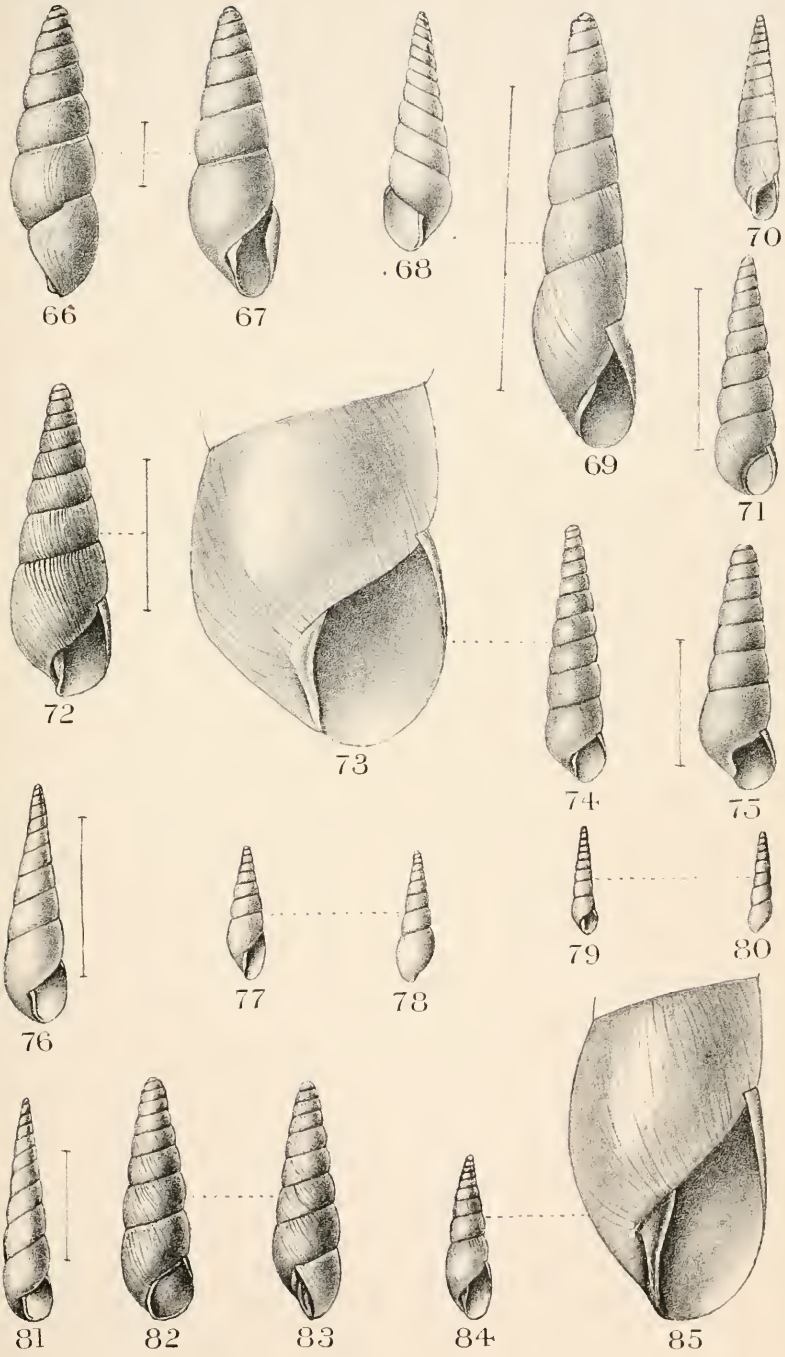
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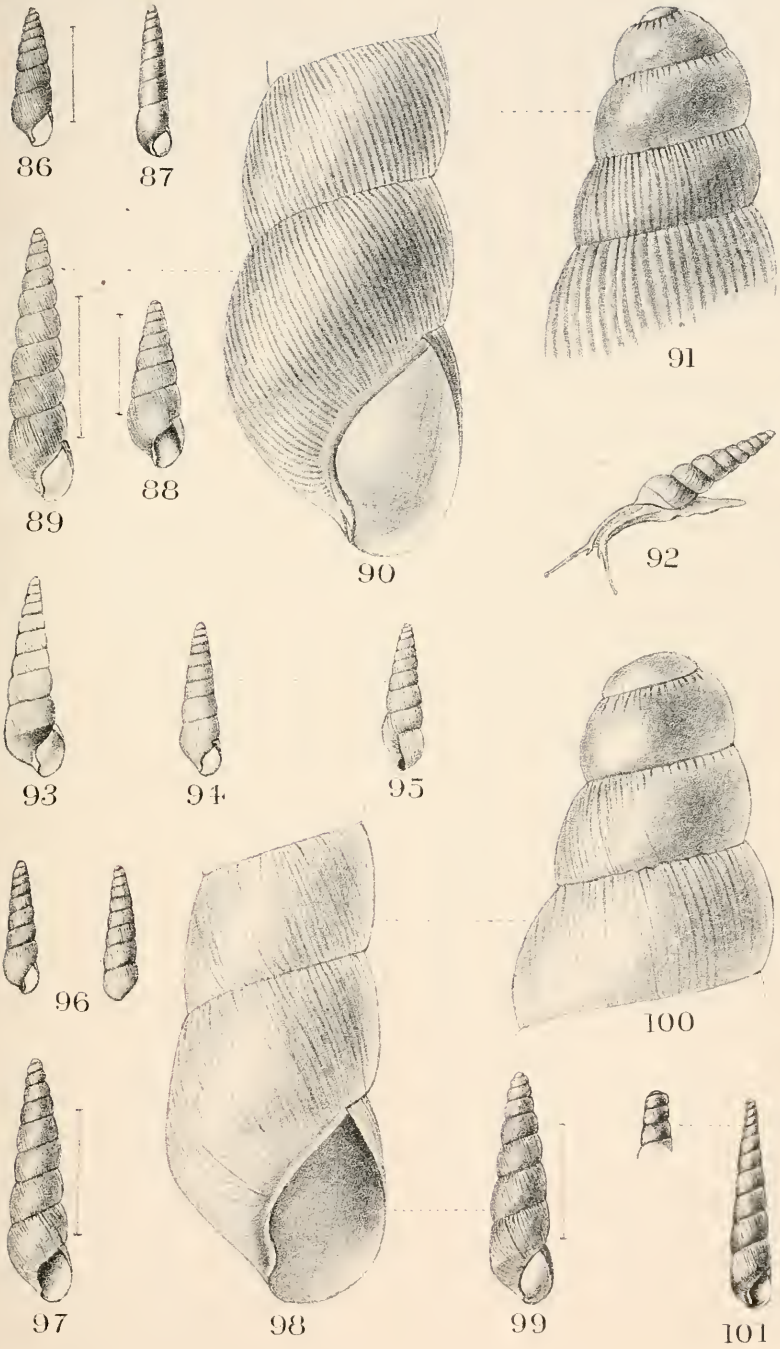
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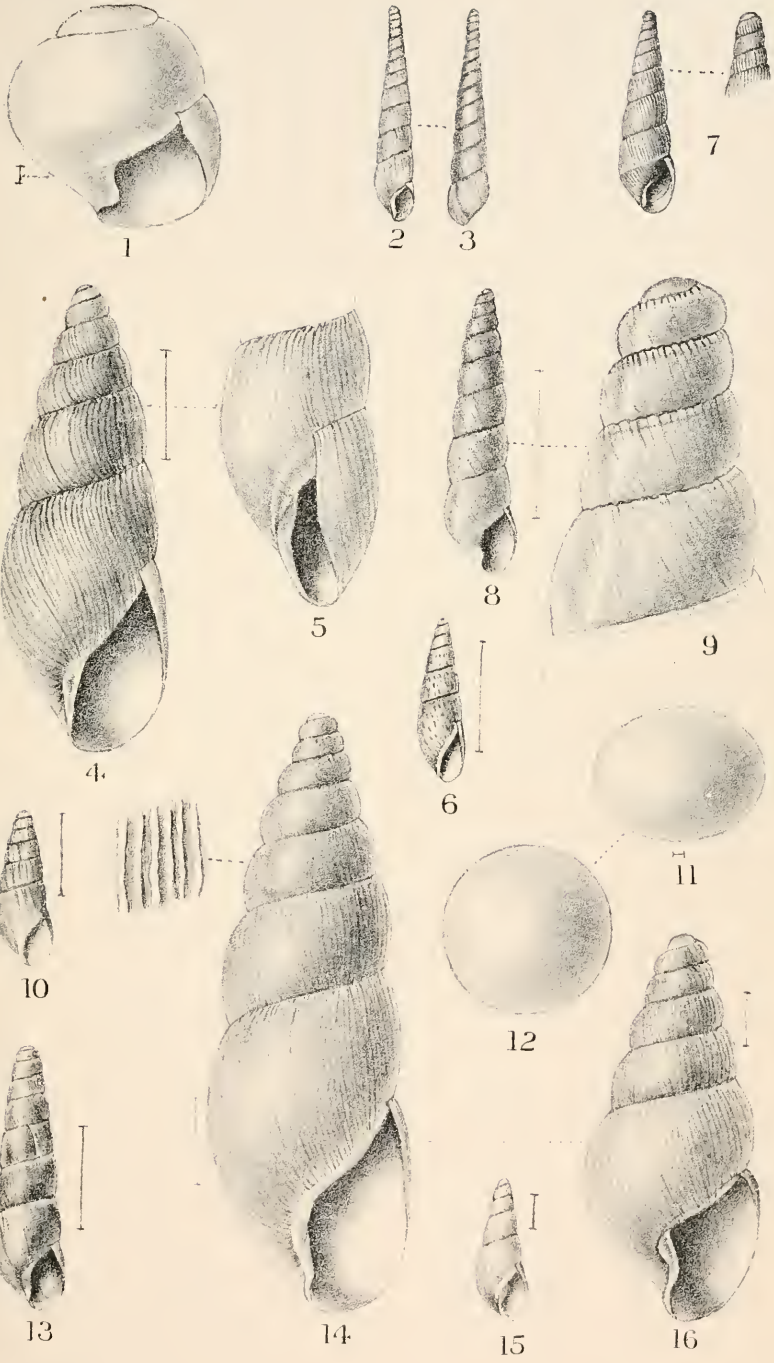
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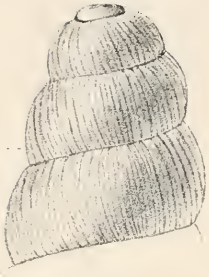

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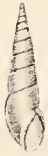

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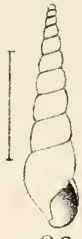
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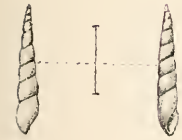
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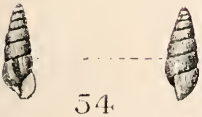
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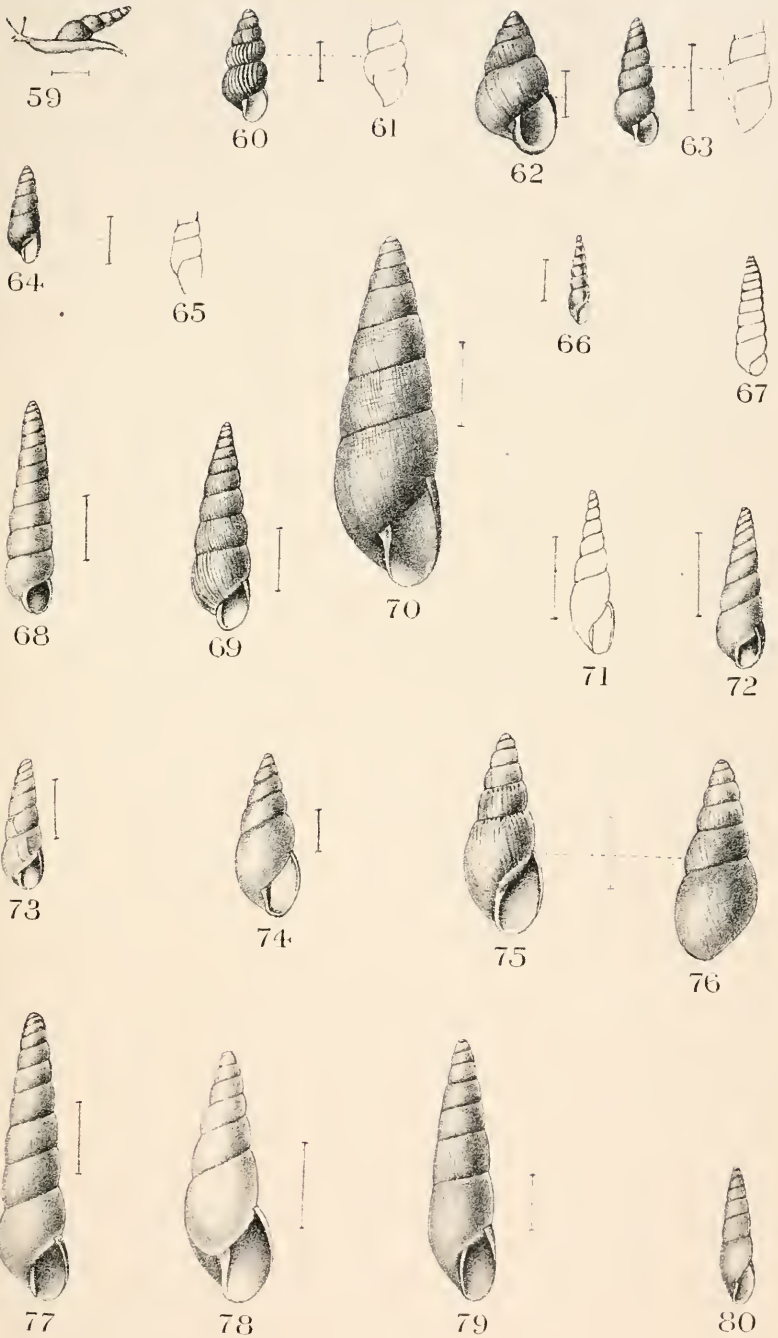
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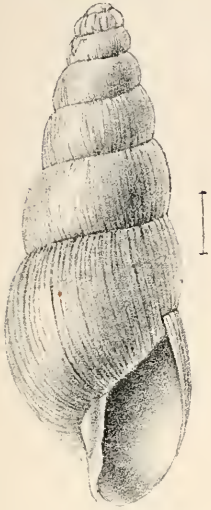

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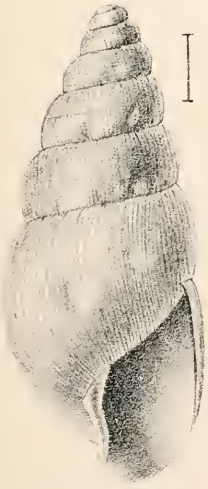

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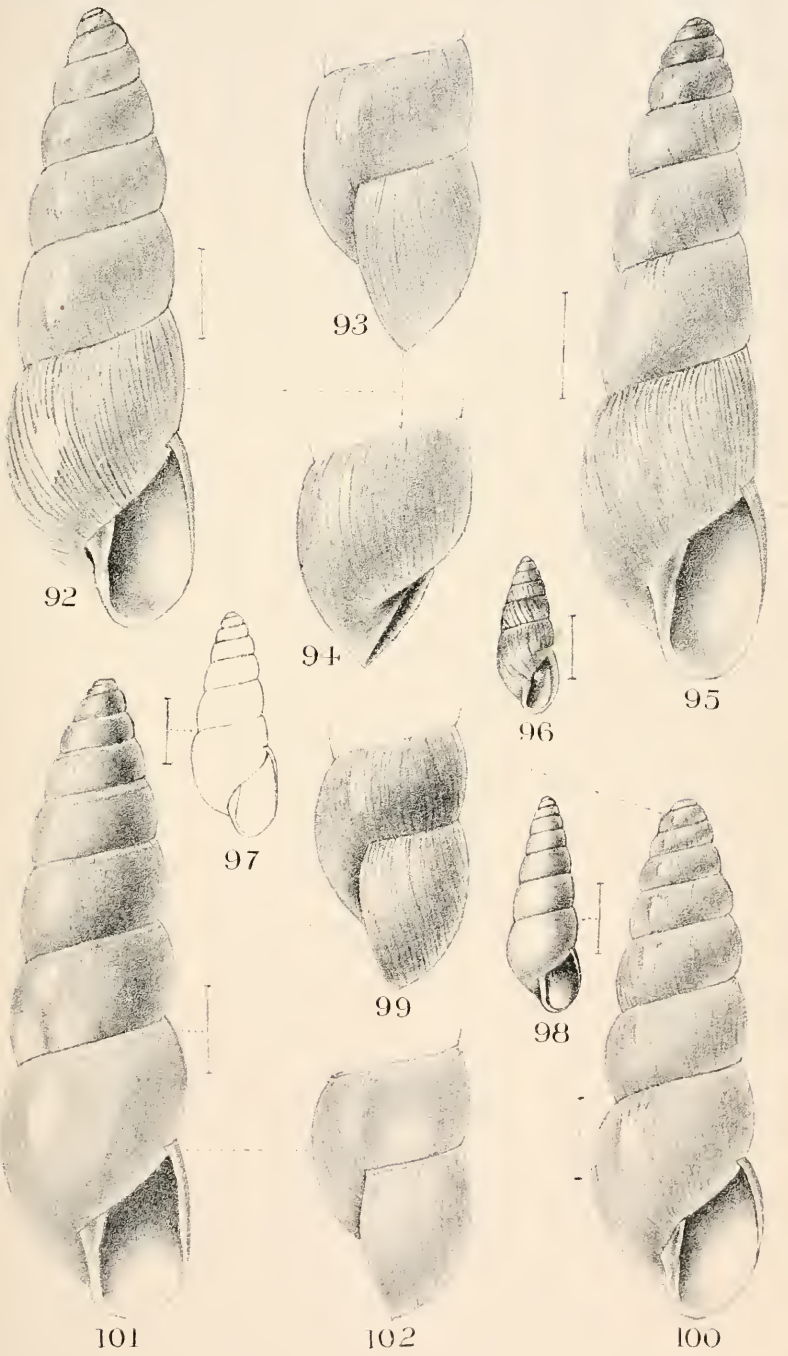
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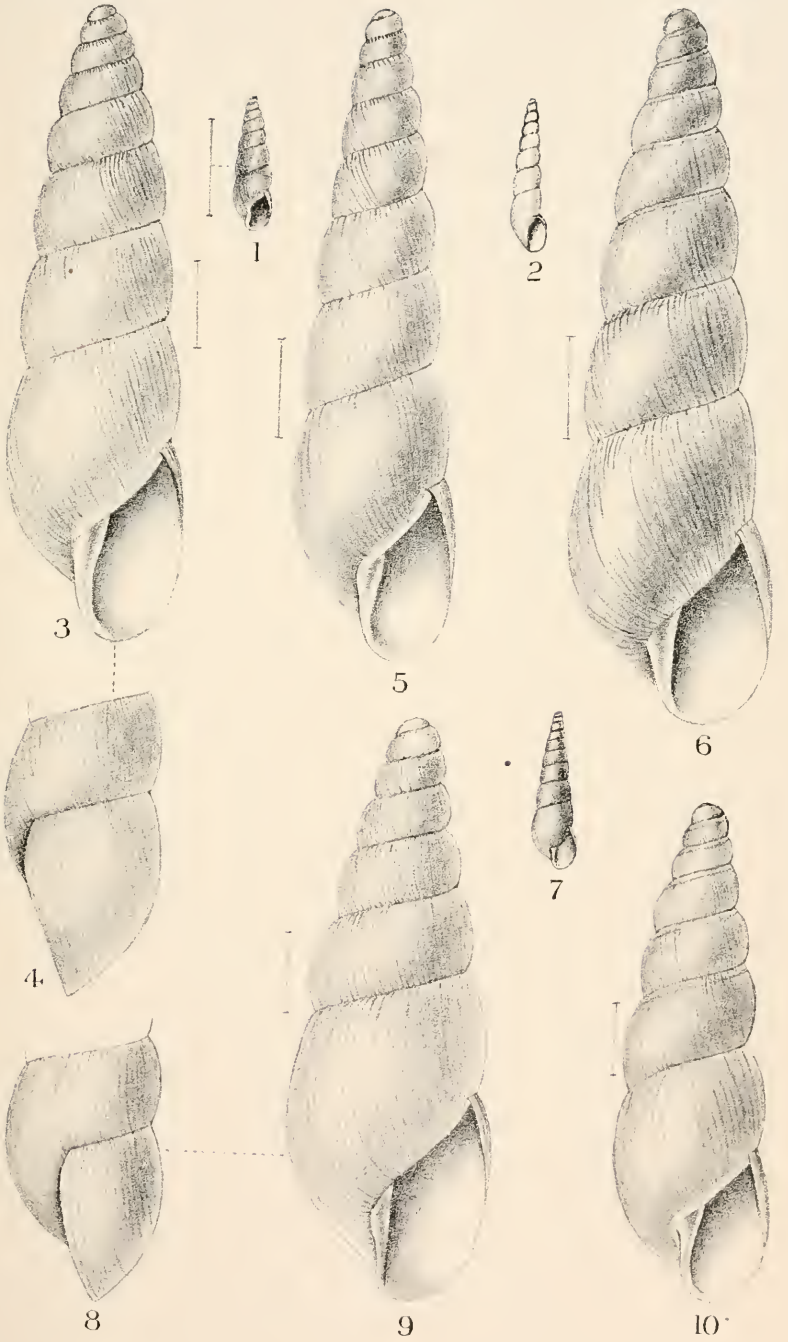
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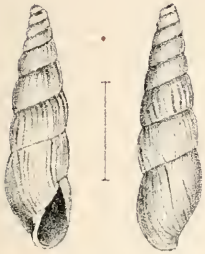
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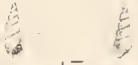

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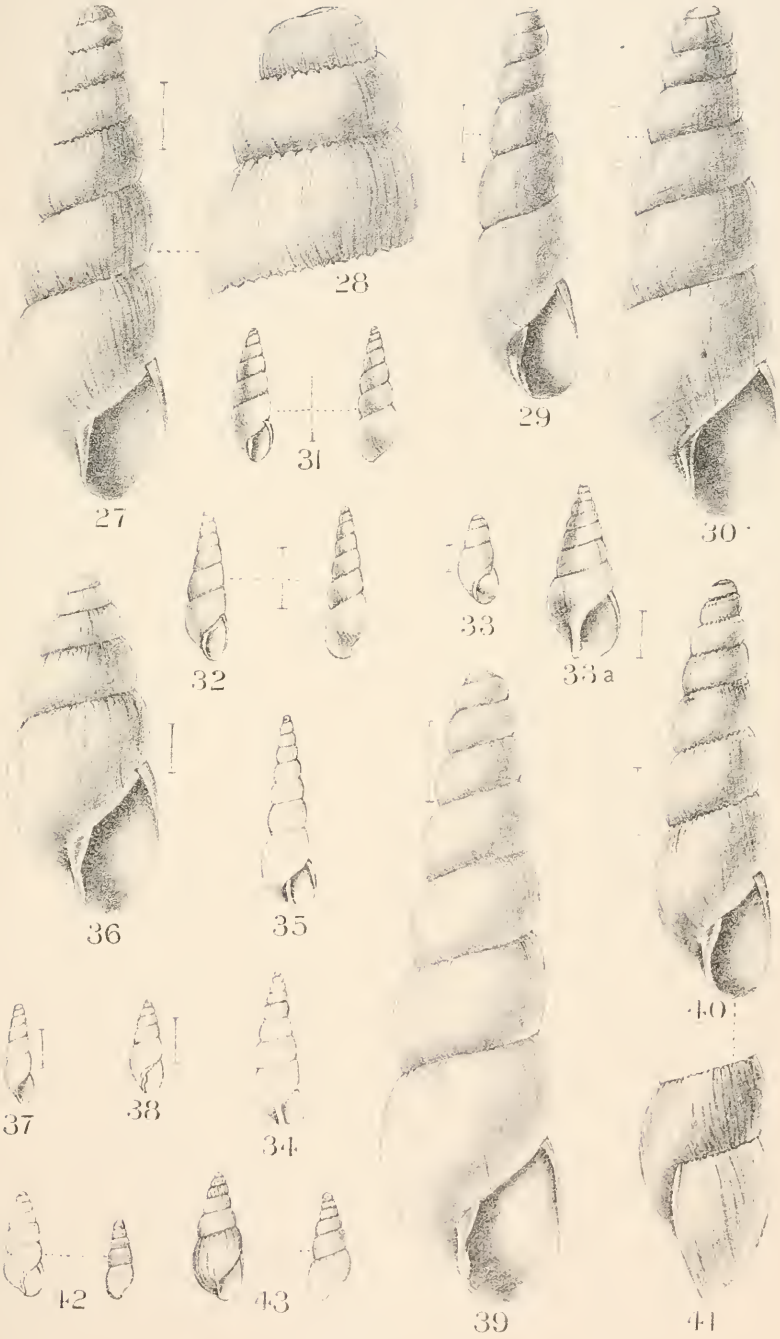
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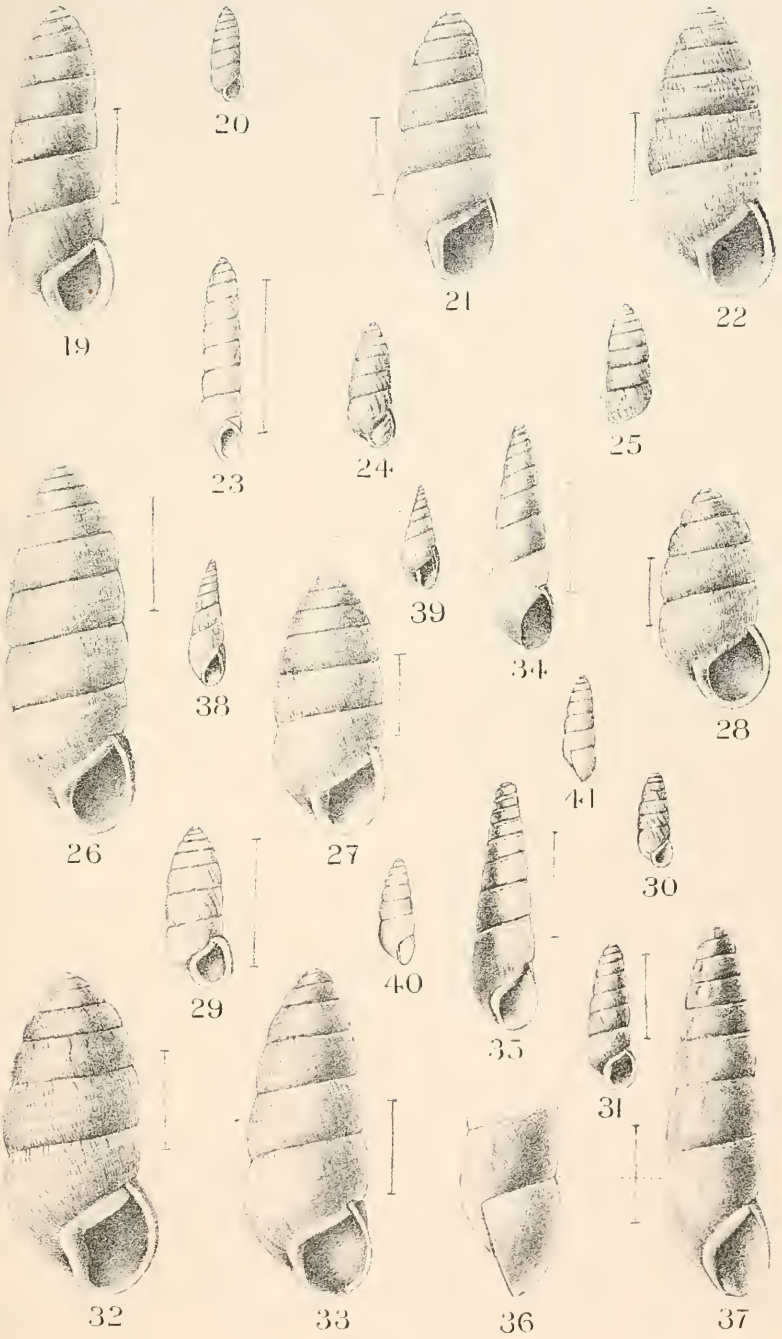
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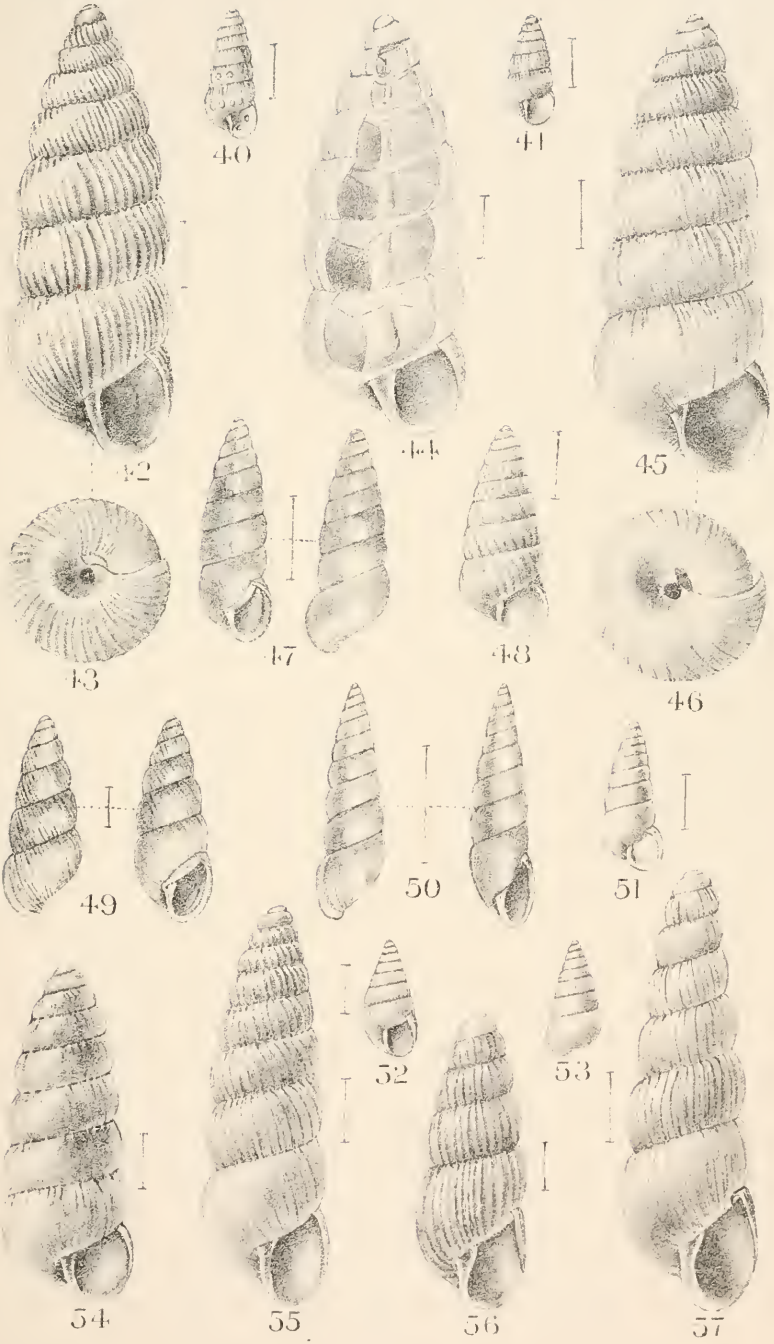
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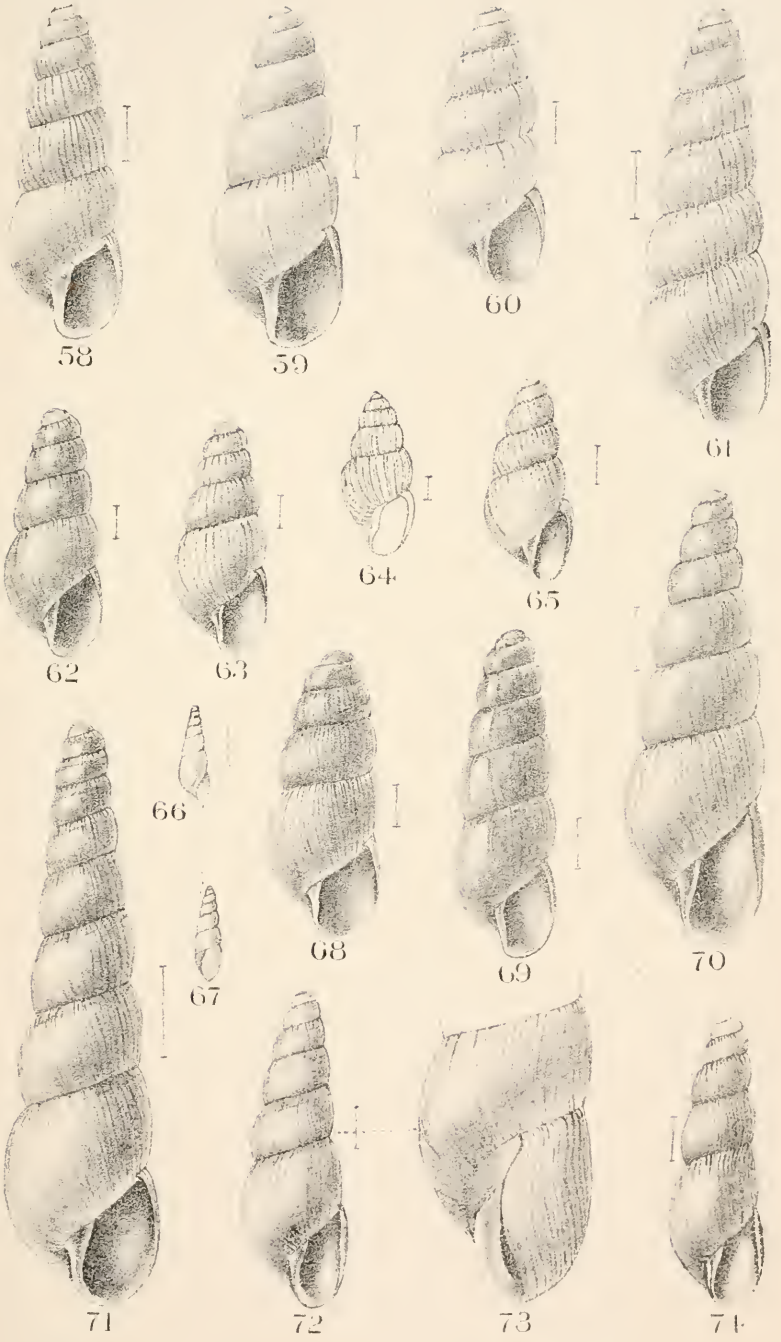
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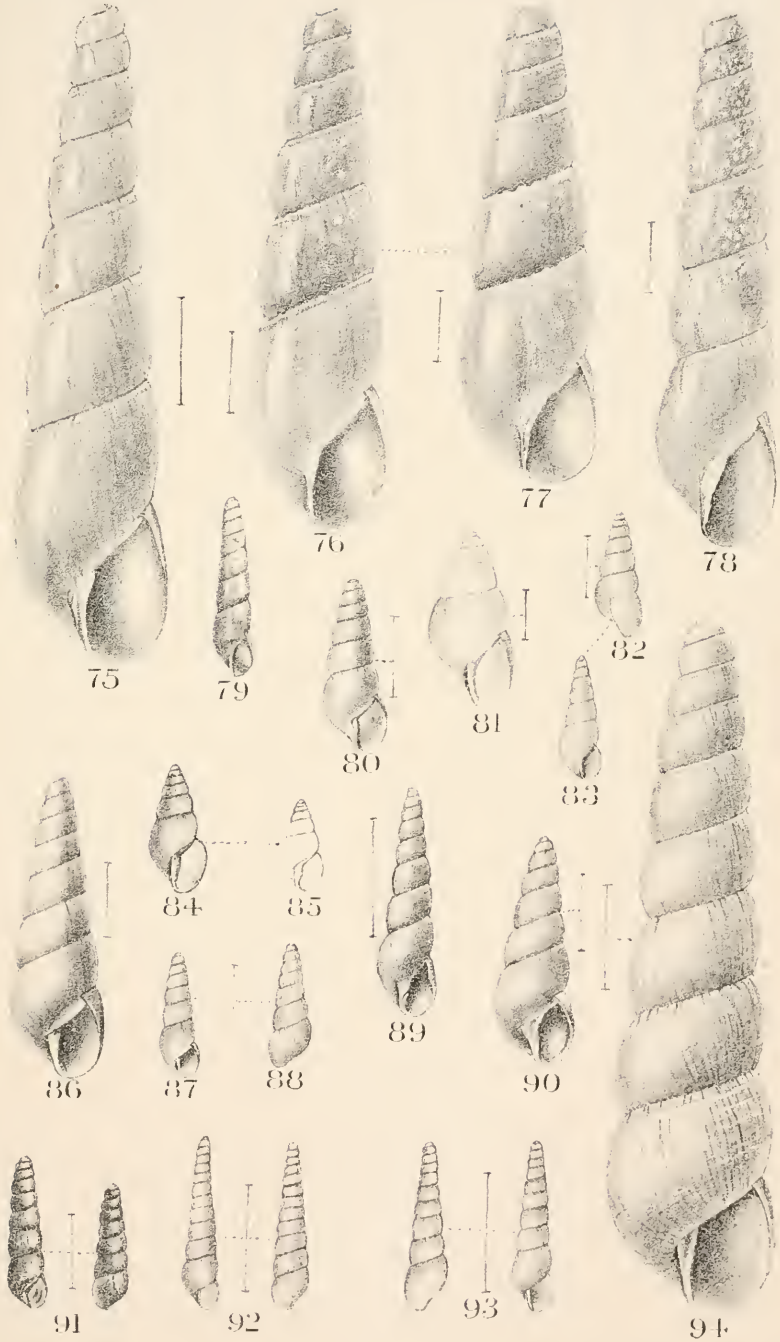
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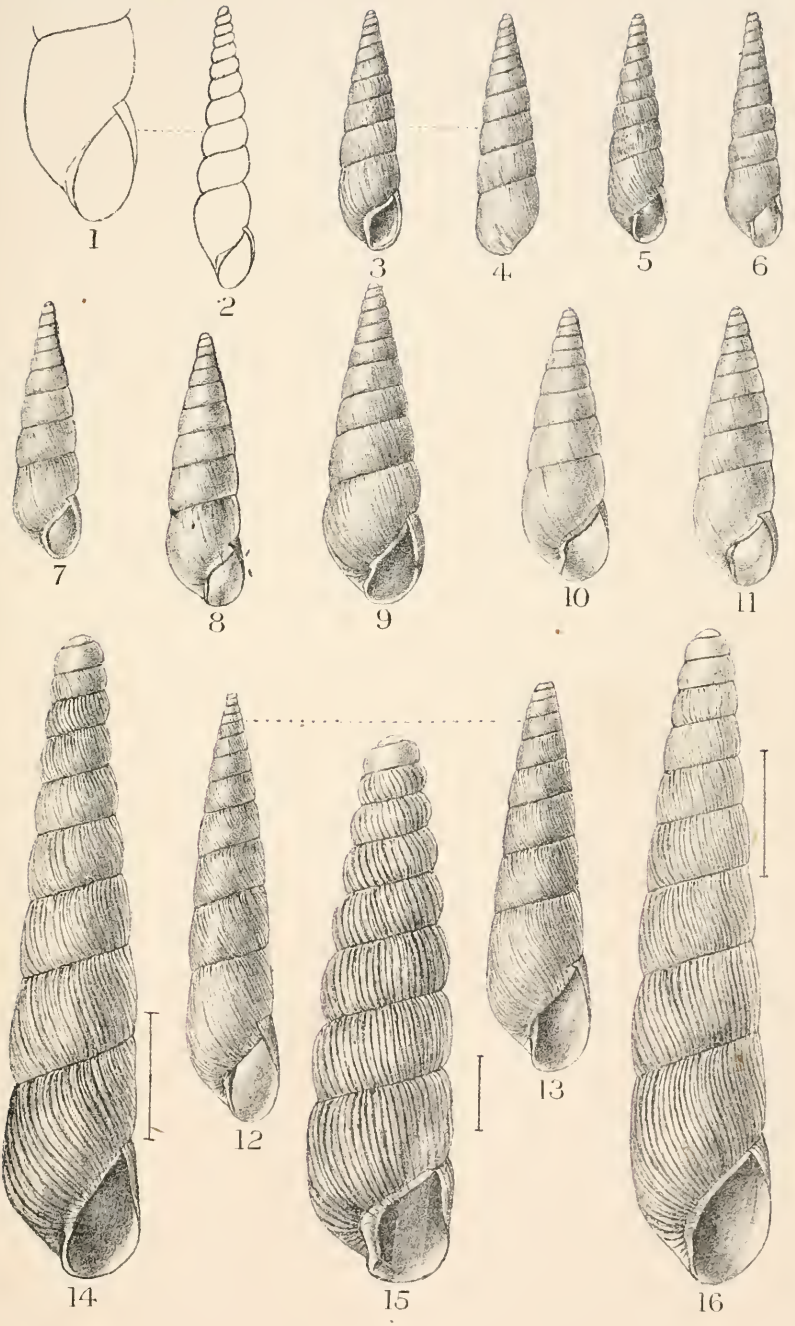
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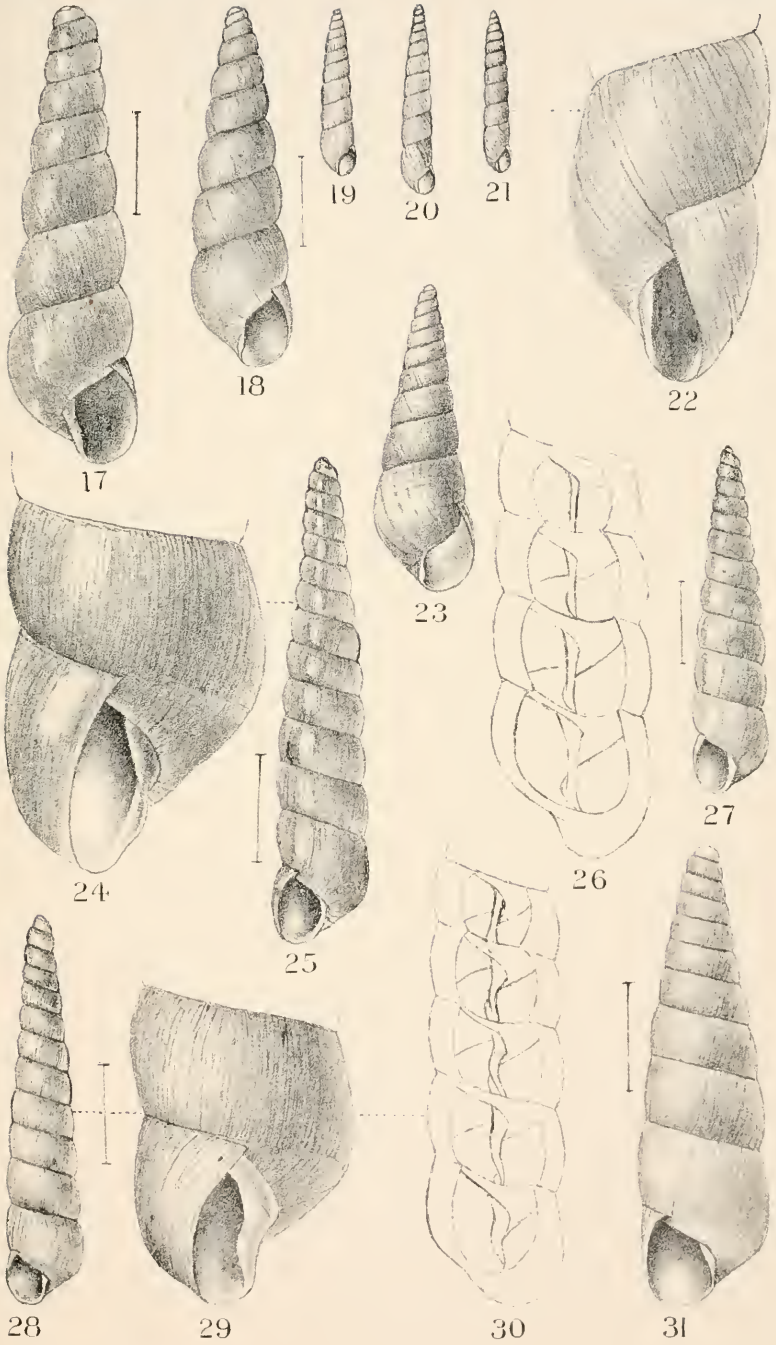
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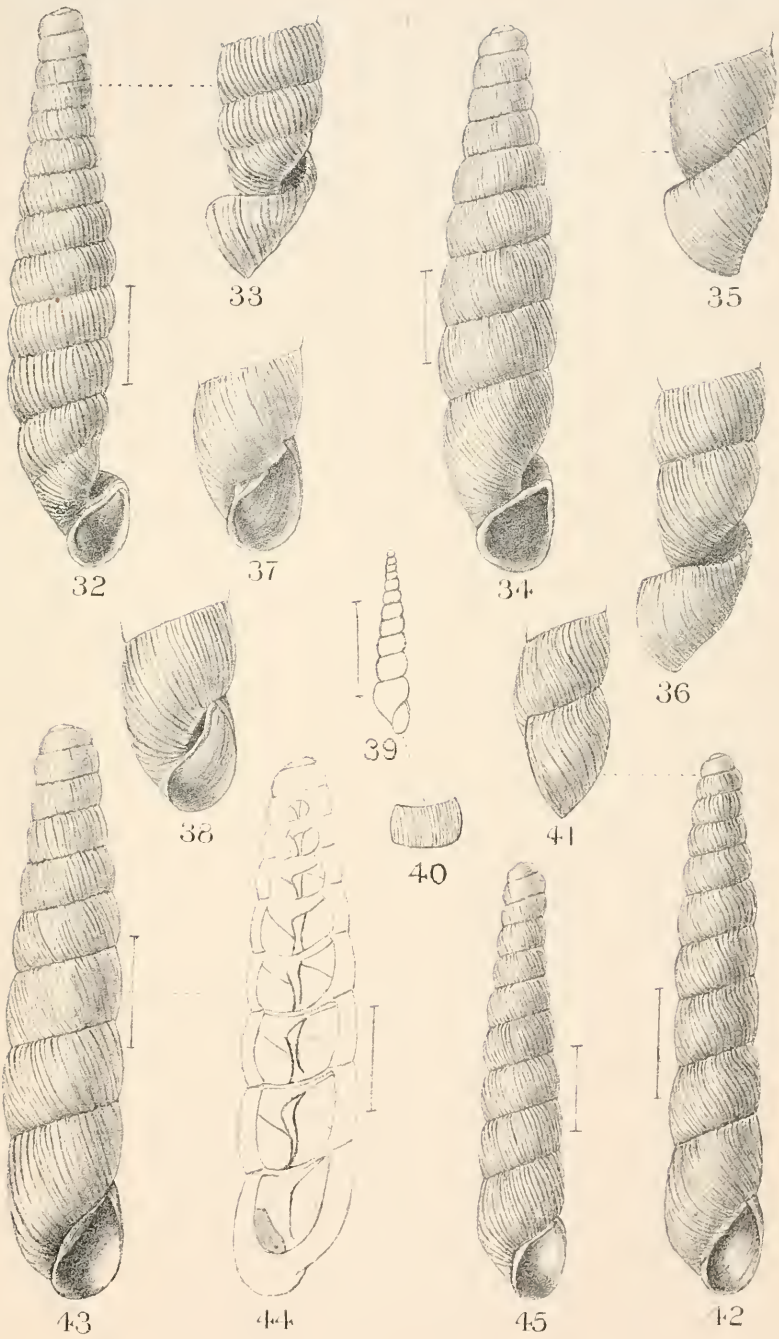
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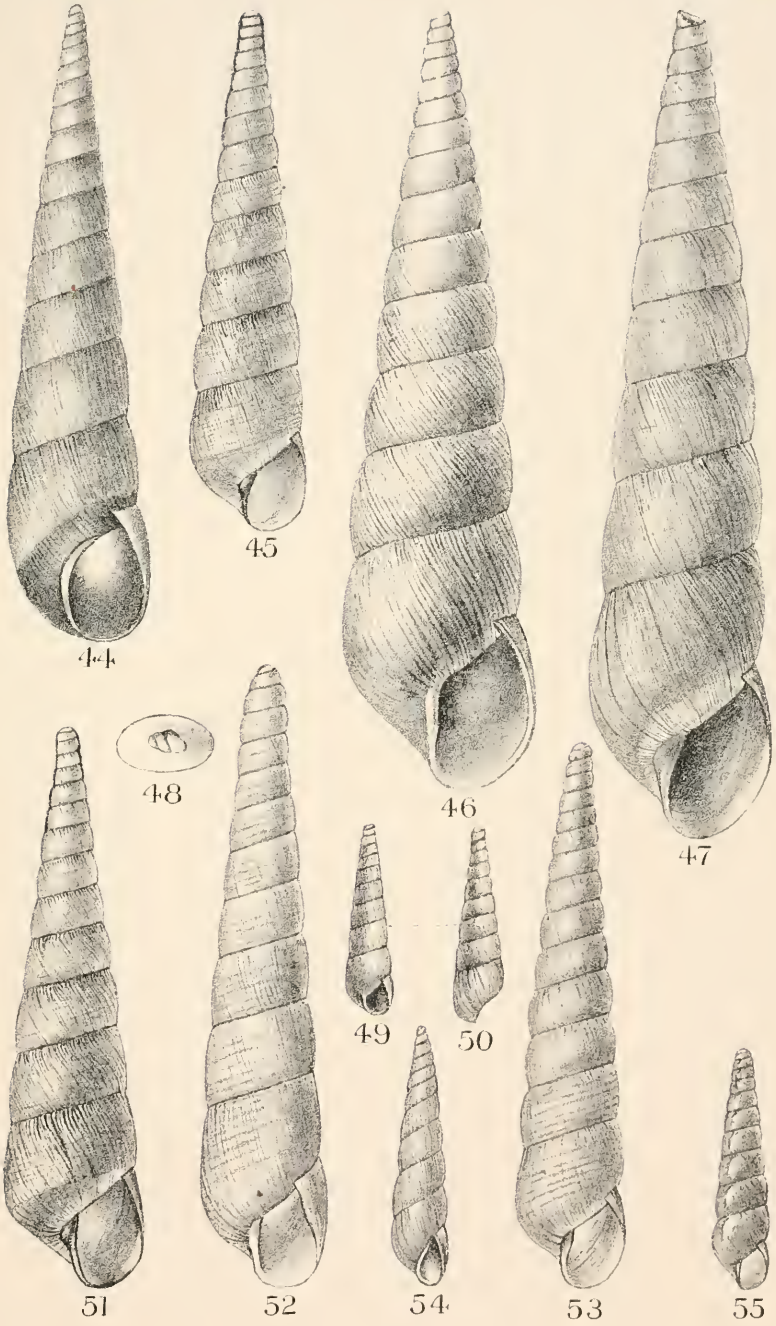
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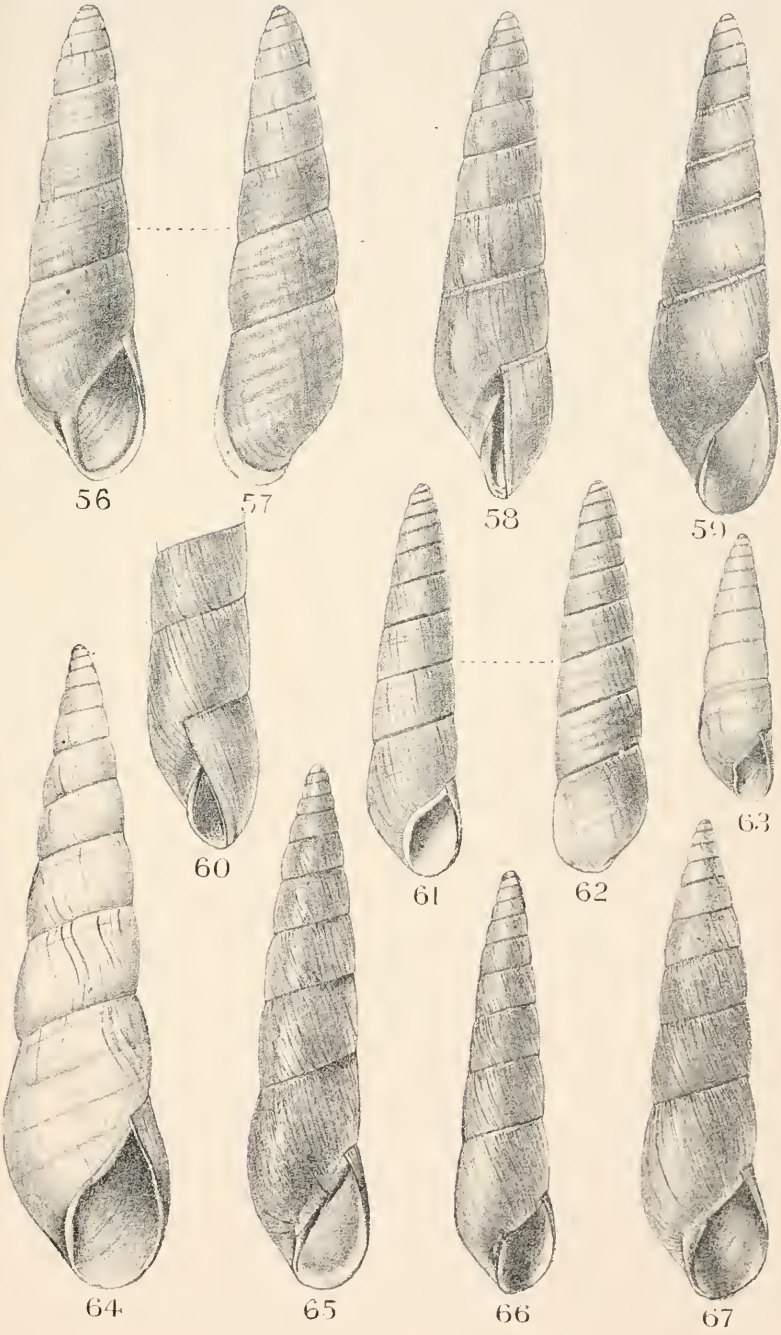
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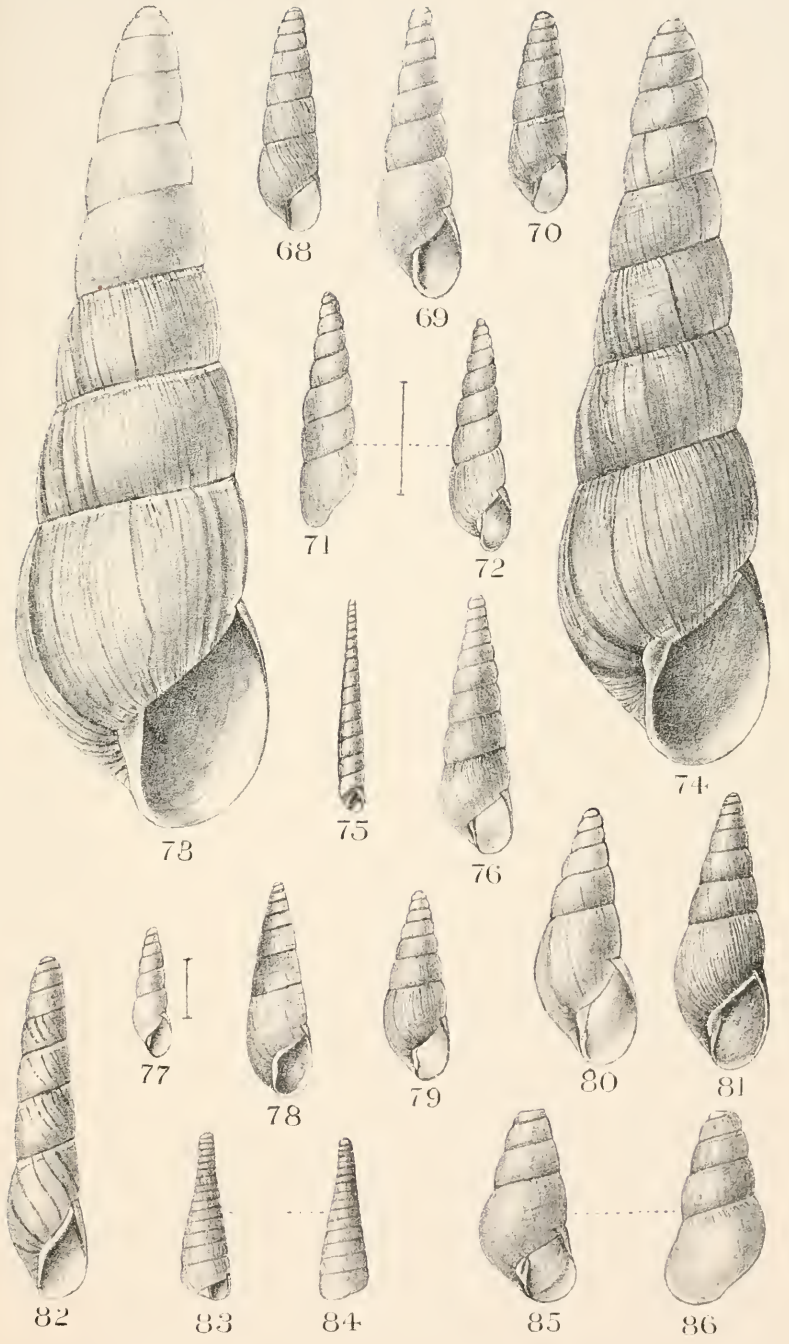
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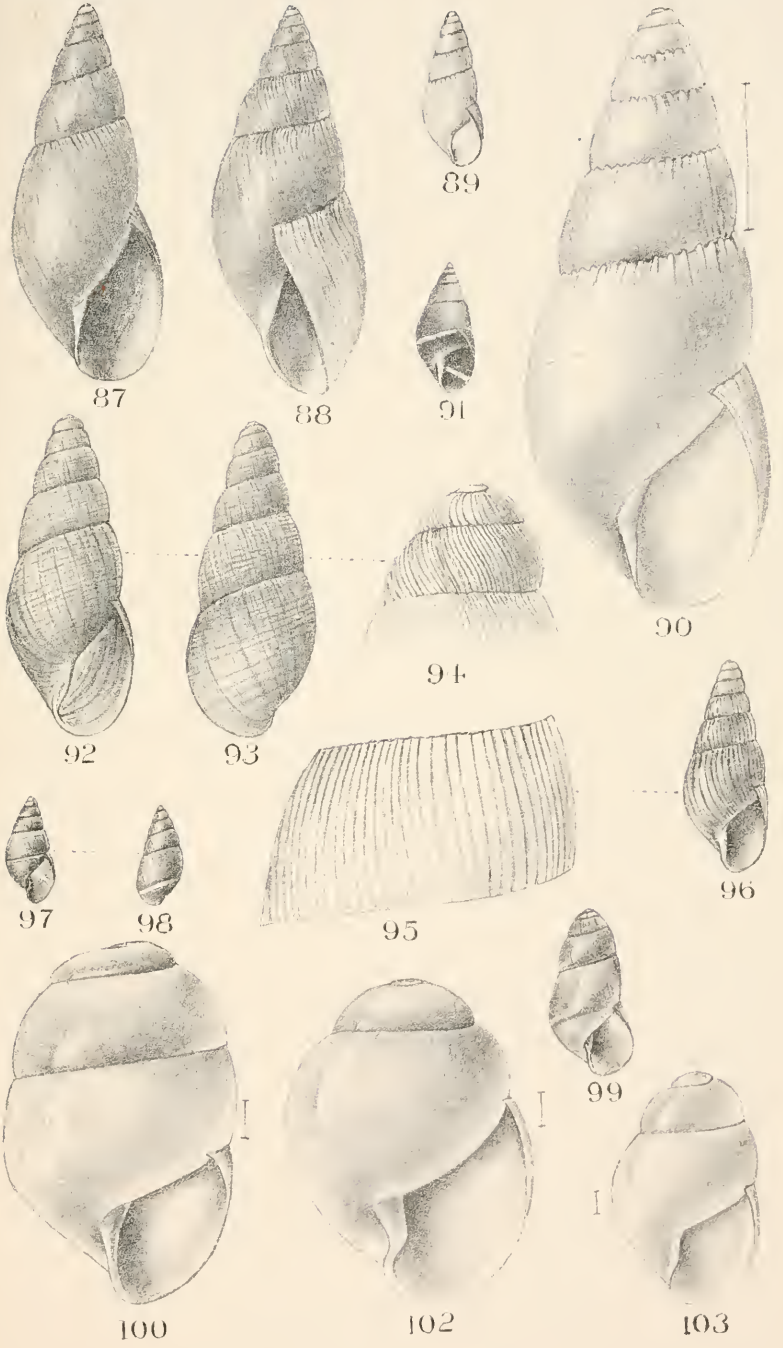
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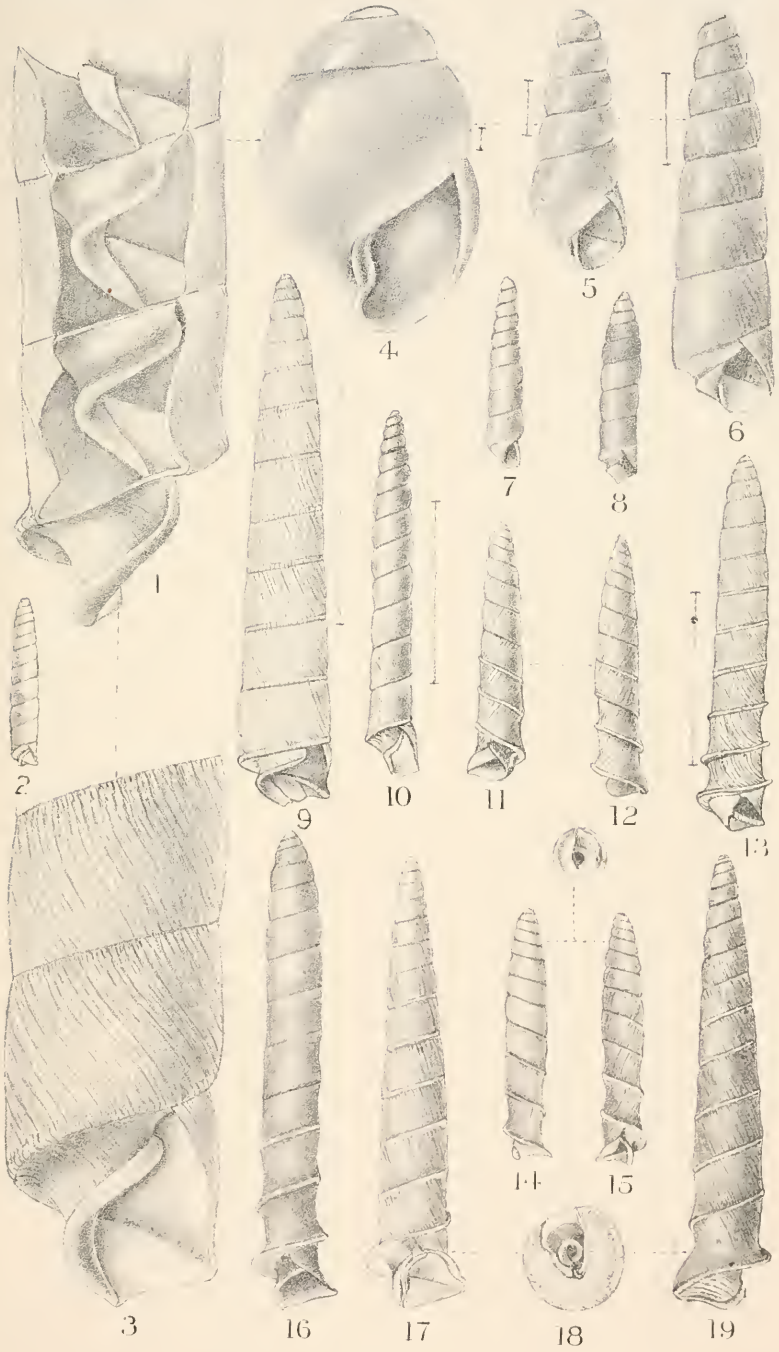
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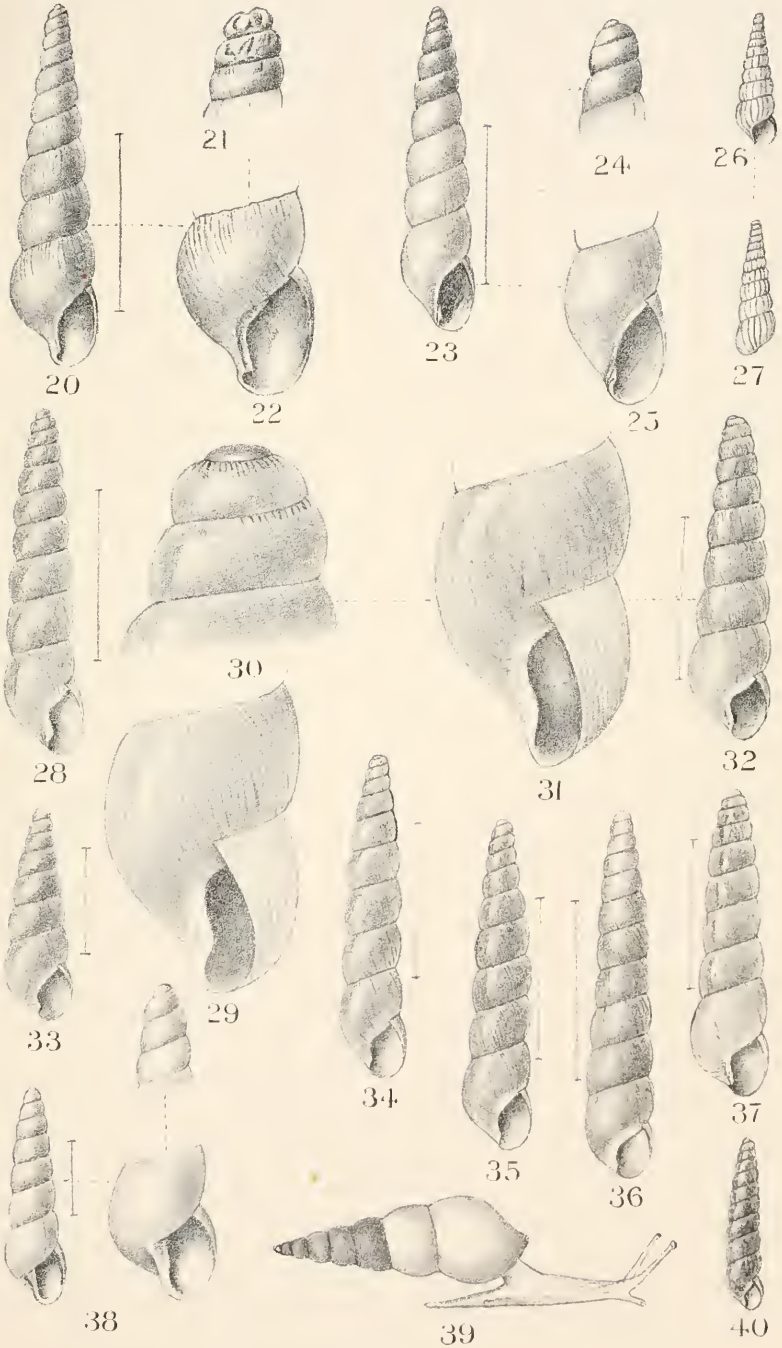
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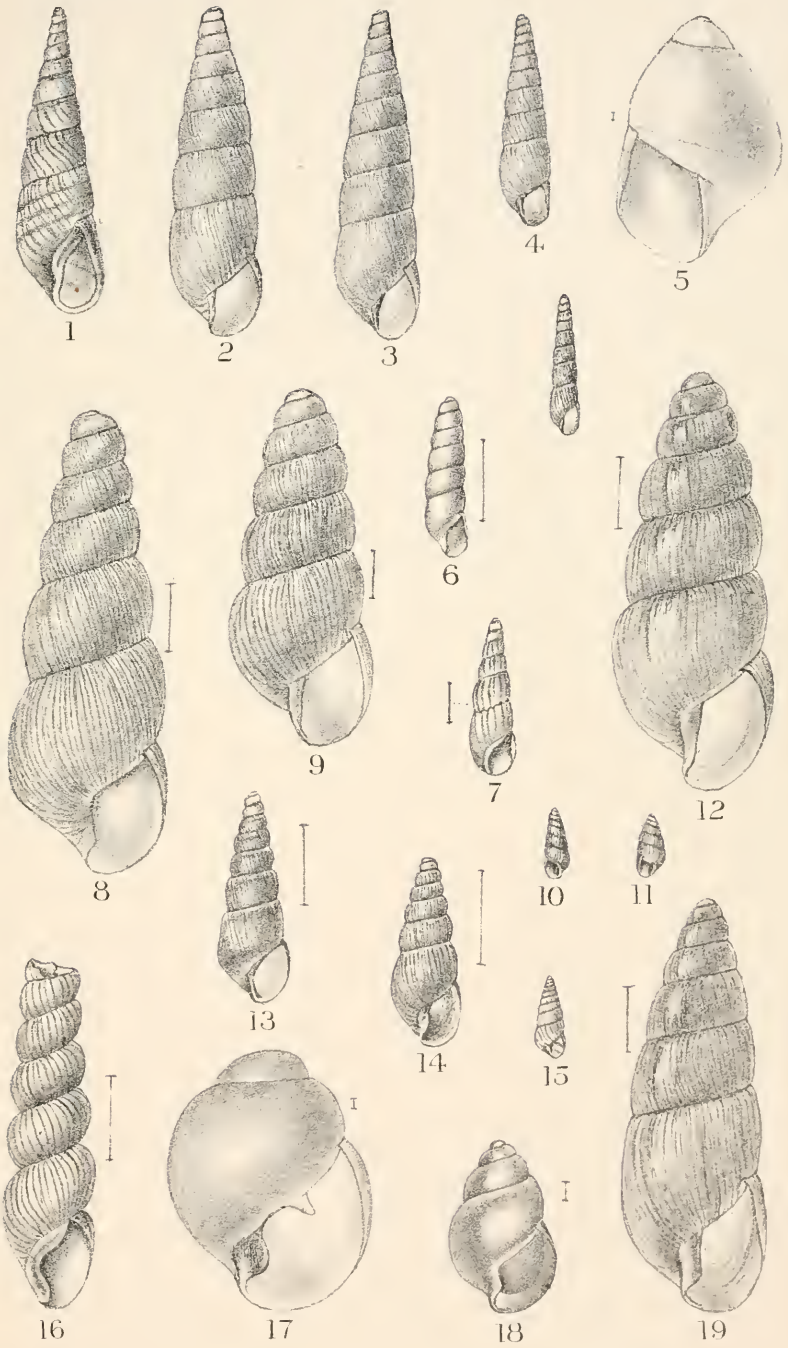
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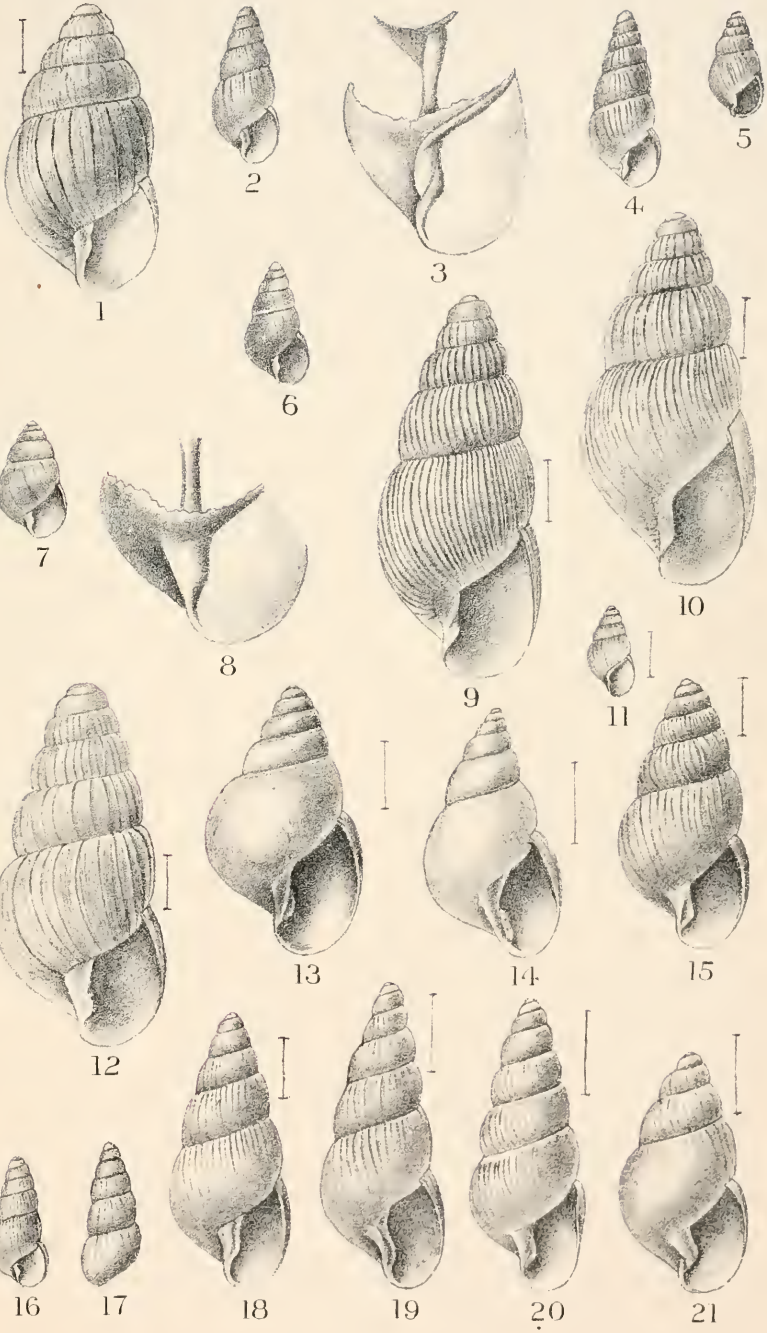
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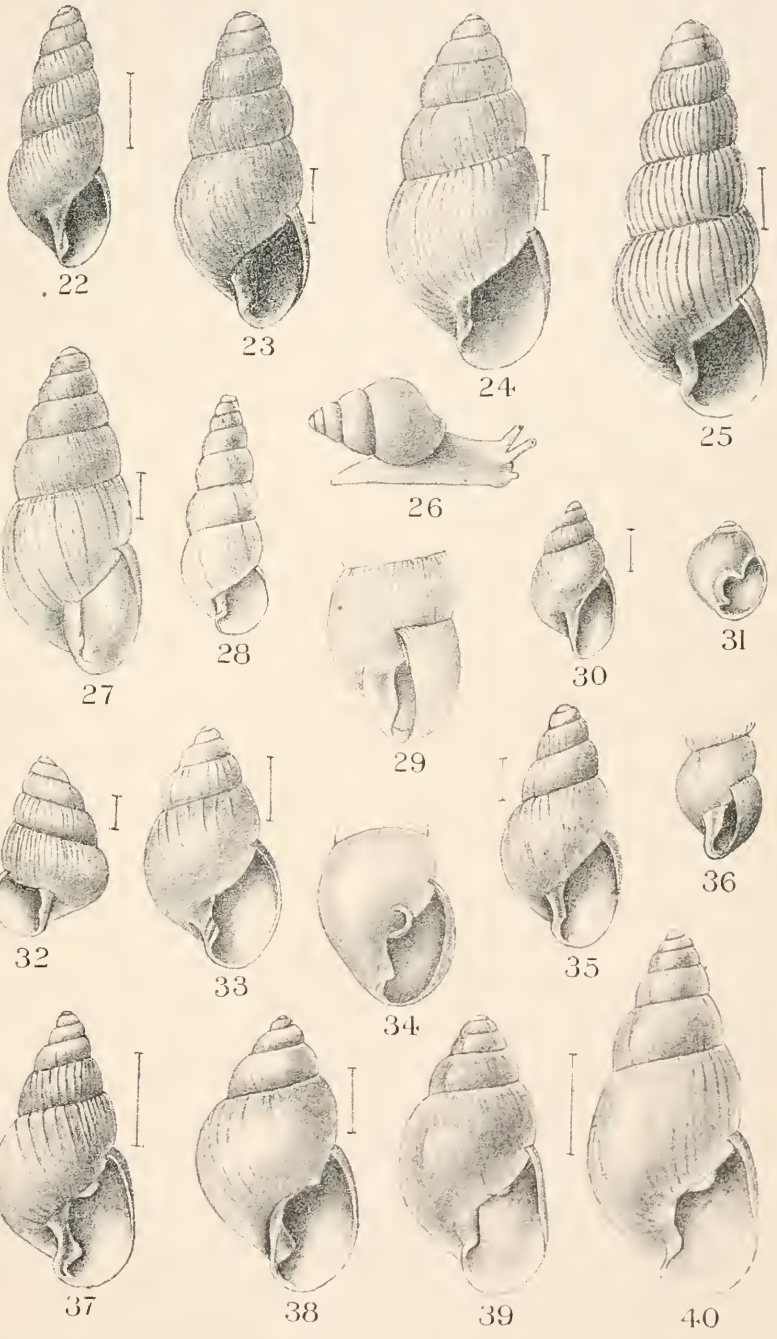
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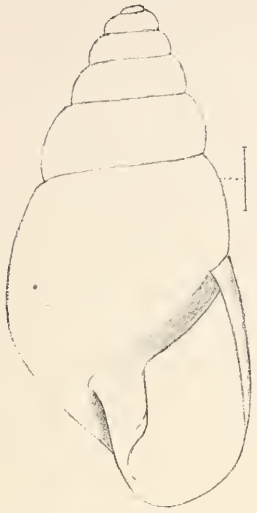

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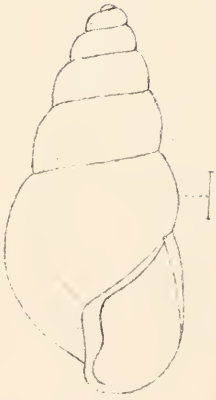

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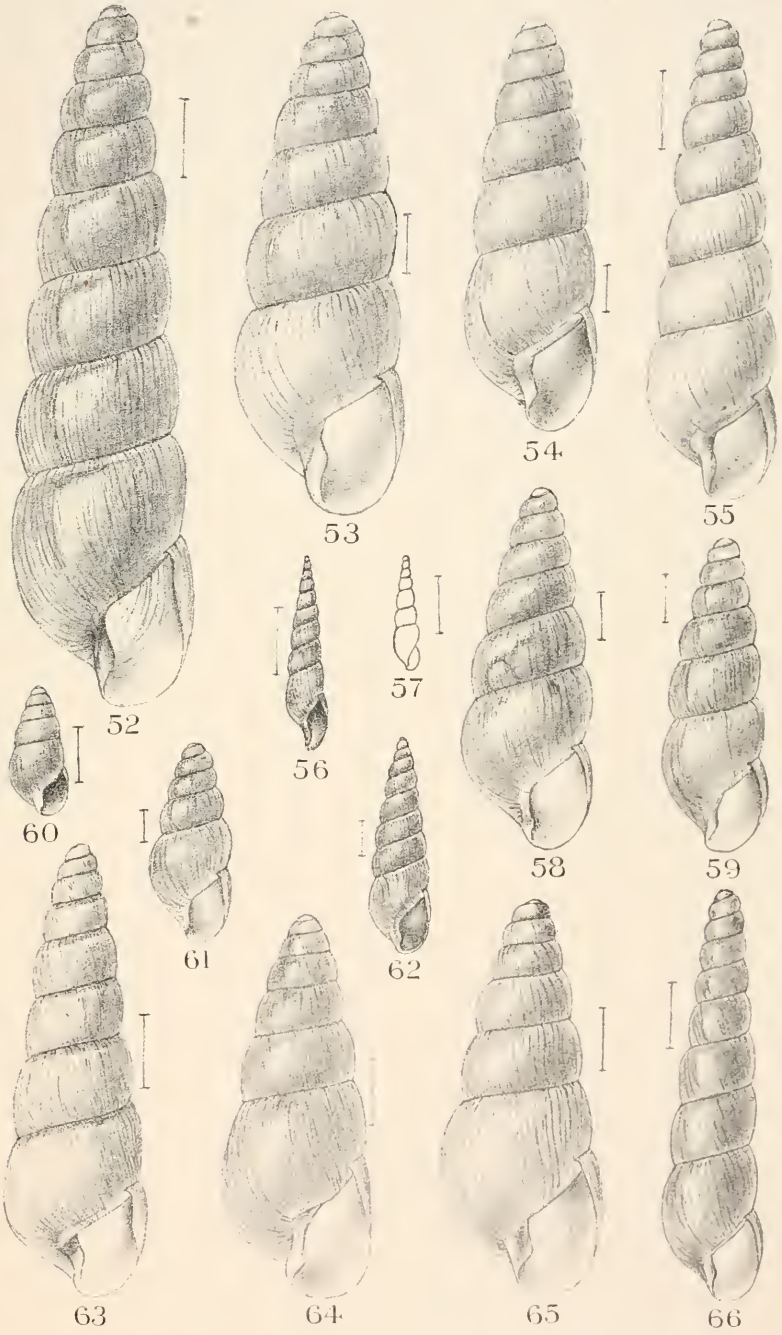
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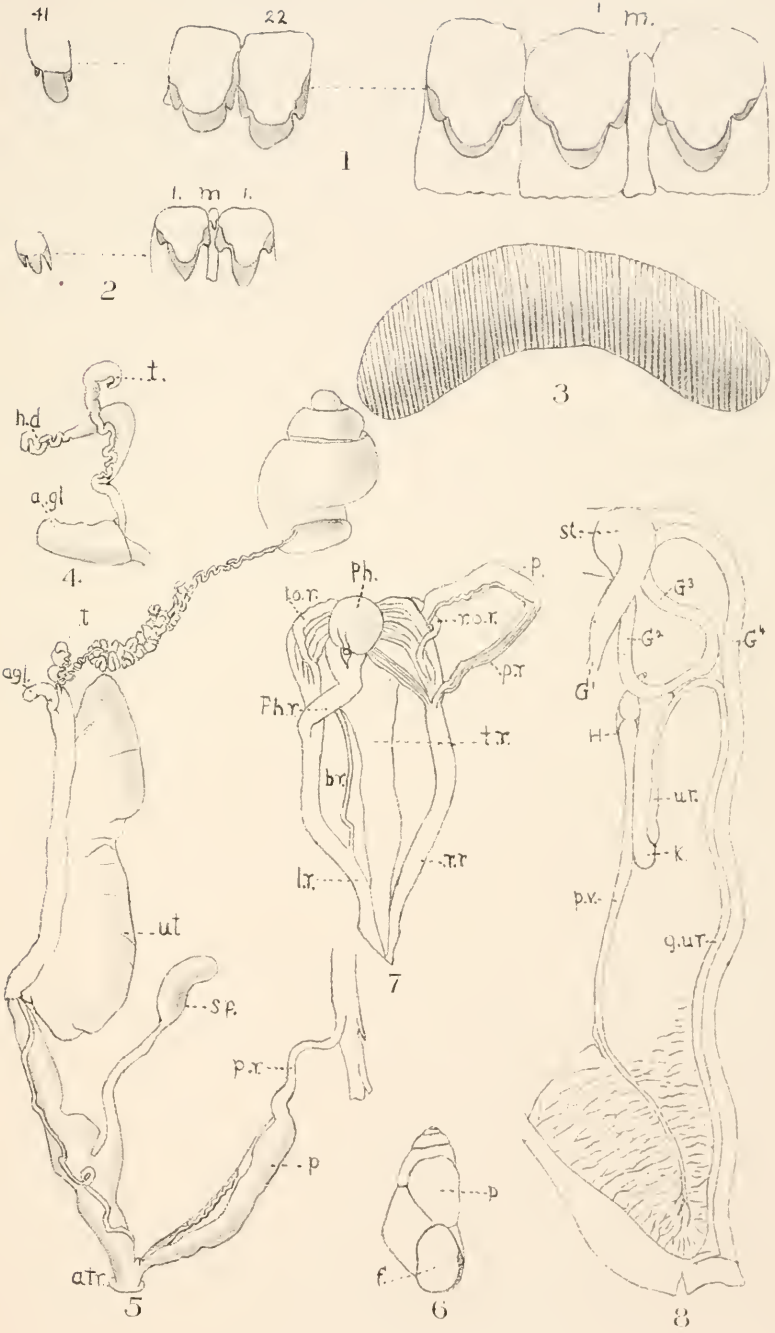
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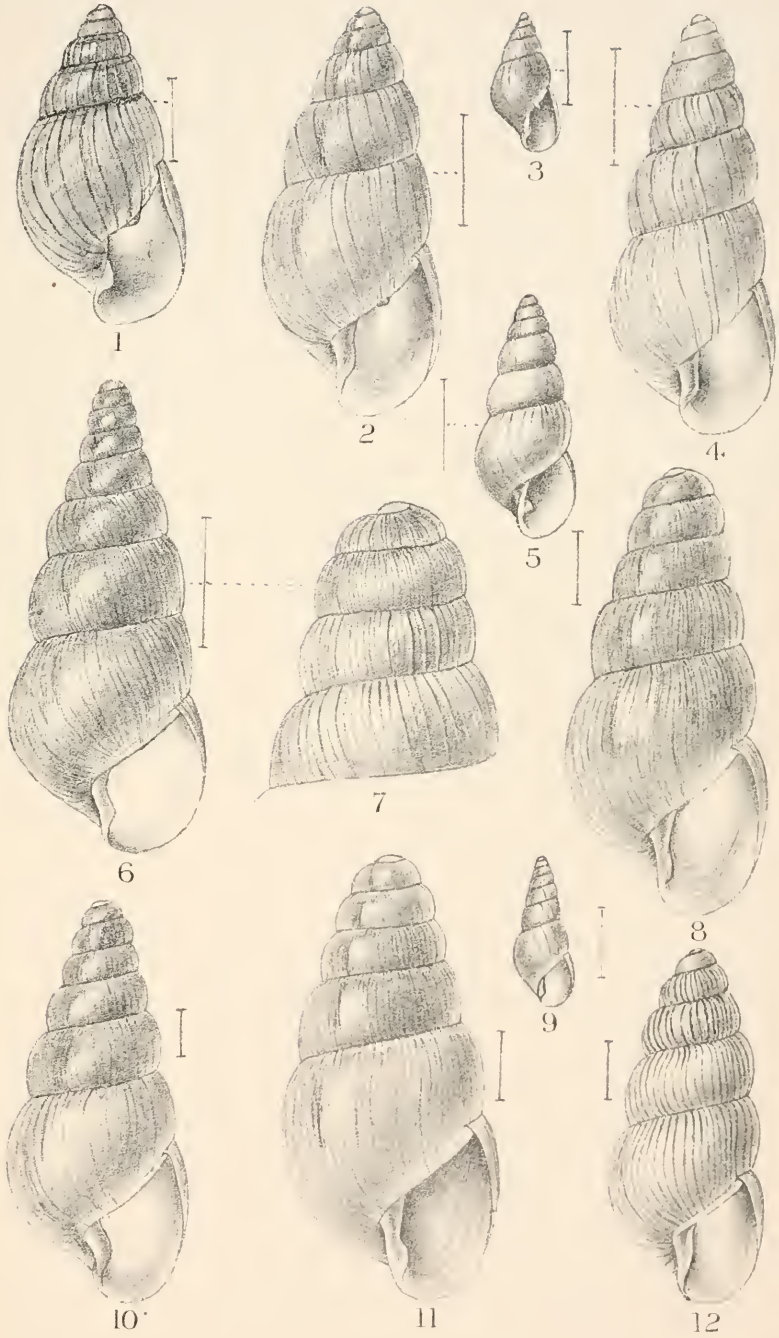
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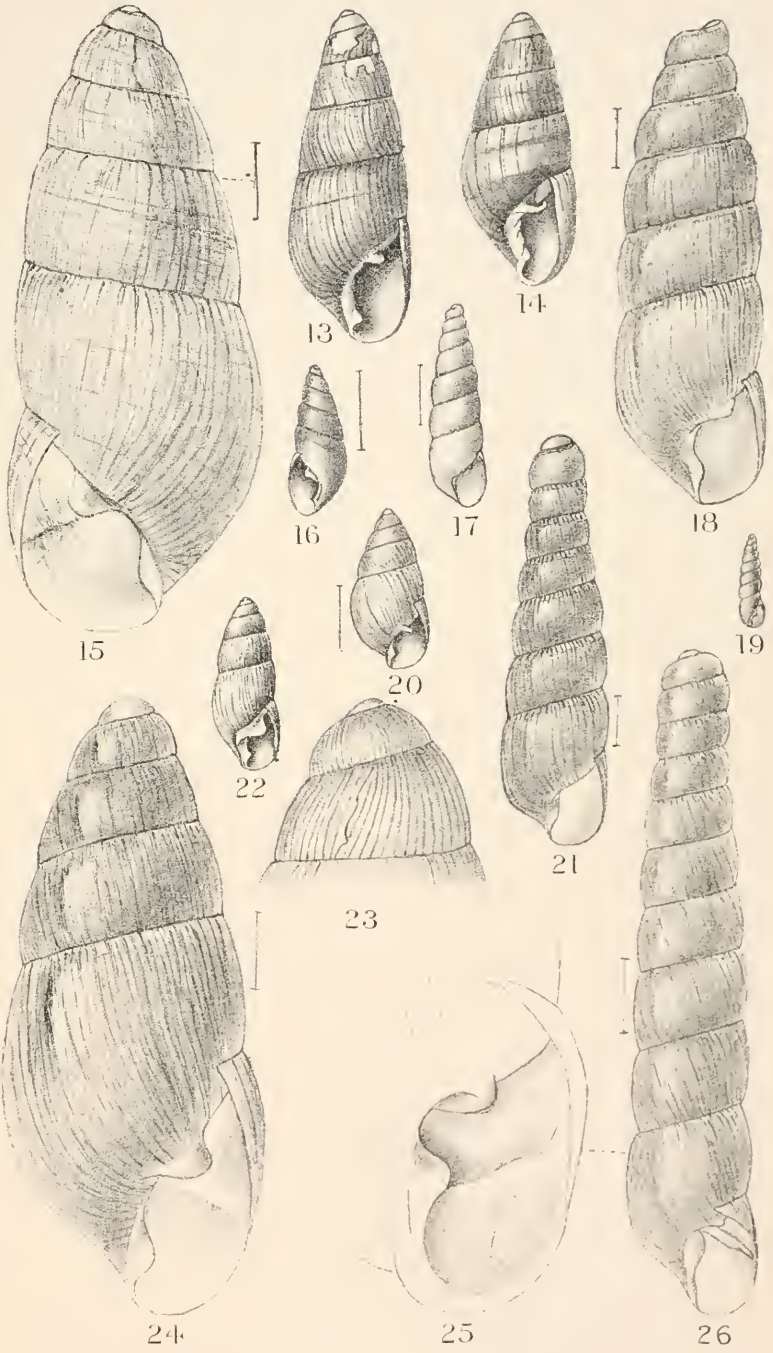
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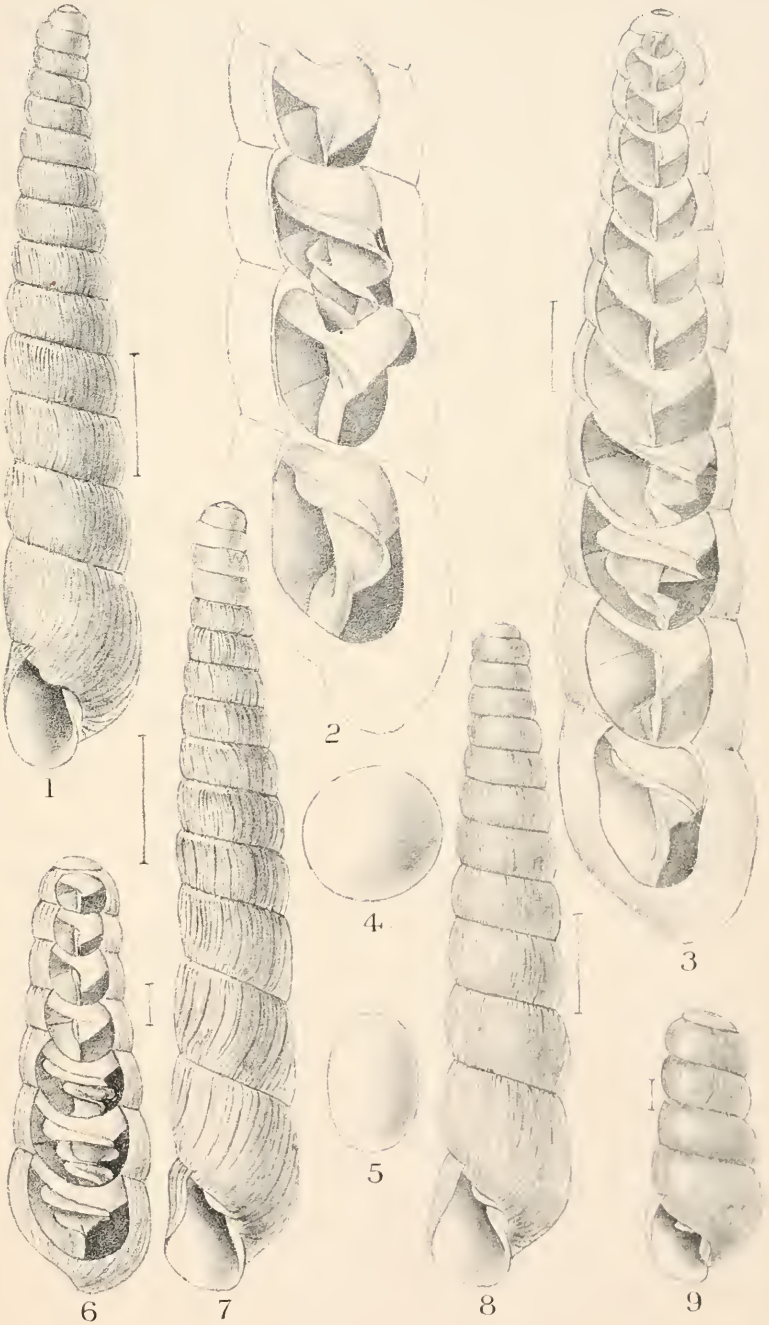
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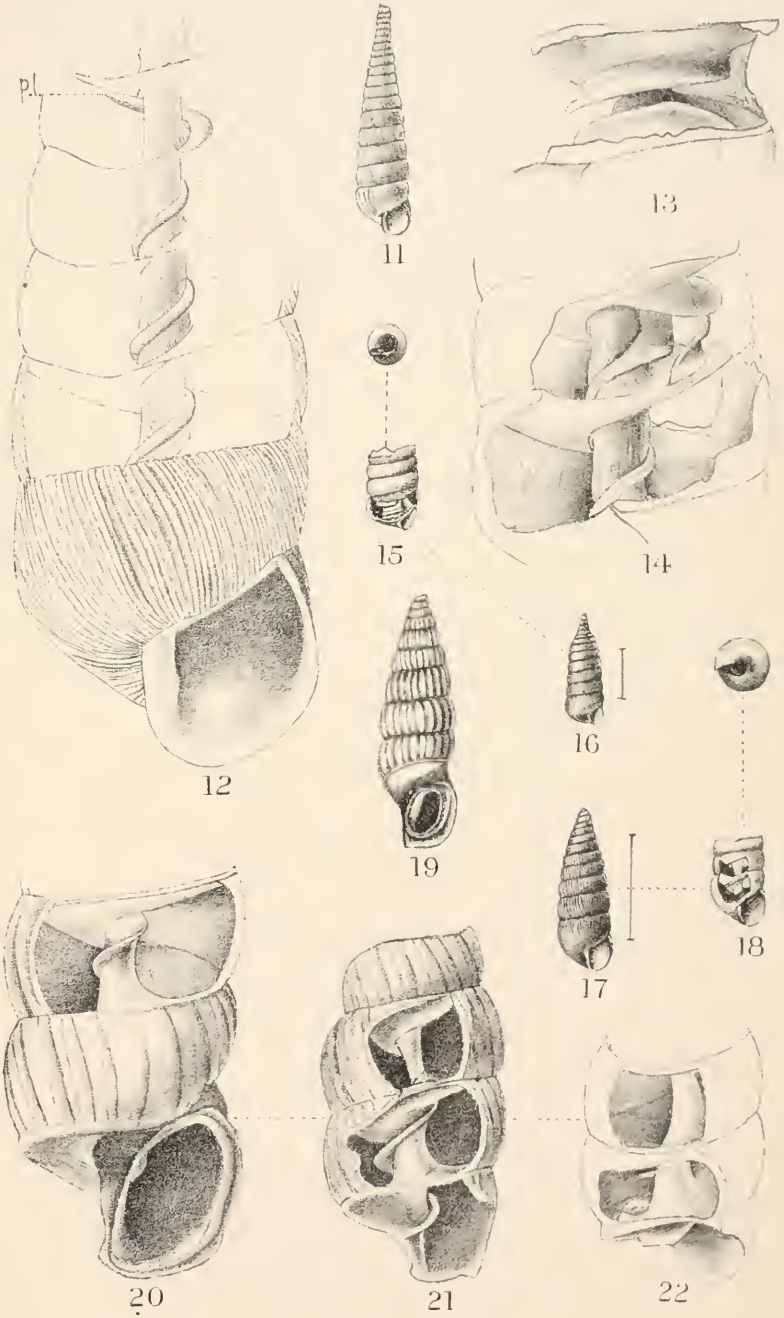
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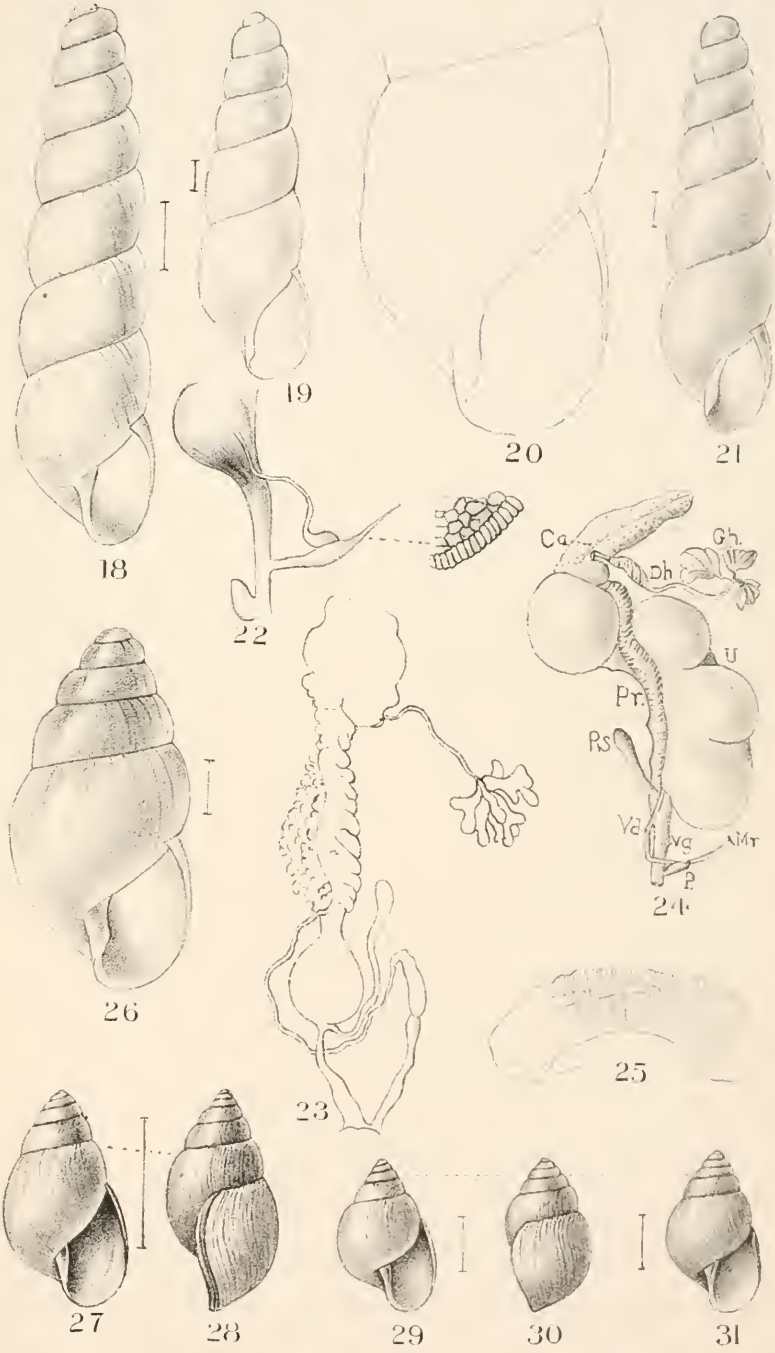
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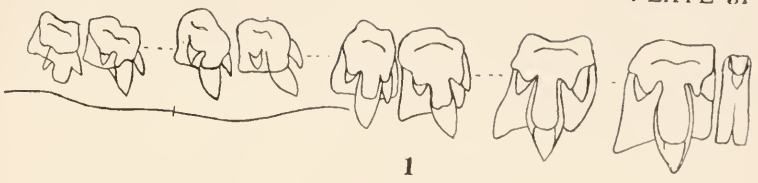

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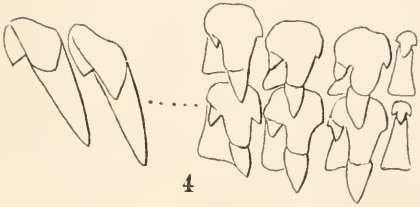

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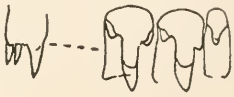

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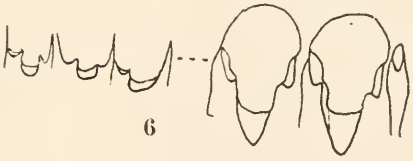

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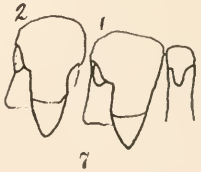

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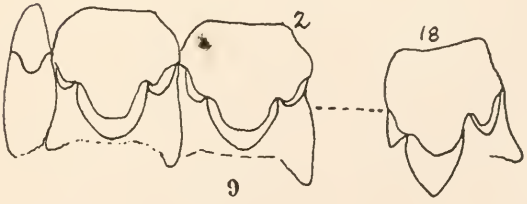

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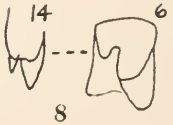

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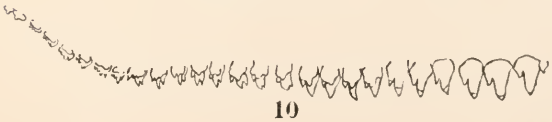

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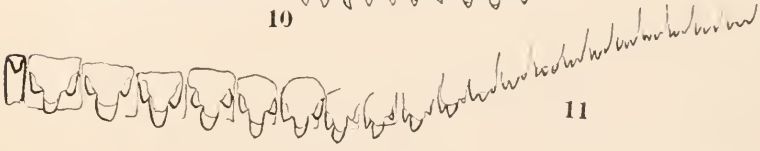

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